Report of the Fraser River Panel to the Pacific Salmon Commission on the 2005 Fraser River Sockeye and Pink Salmon Fishing Season

Prepared by the

Pacific Salmon Commission
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REPORT OF THE
FRASER RIVER PANEL
TO THE PACIFIC SALMON COMMISSION
ON THE 2005 FRASER RIVER SOCKEYE AND PINK SALMON FISHING SEASON

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I. EXECUTIVE SUMMARY

Pre-season Planning

1. On February 17, 2005, the Panel agreed on a revised Annex IV, Chapter 4 of the Pacific Salmon Treaty (Appendix A). The revised Annex in conjunction with guidance from the Commission (Appendix B) established new methods for making management decisions and for calculating the TAC and paybacks from 2005 onward.

2. For Fraser River sockeye salmon, pre-season expectations were for a median run size of 12,548,000 fish, spawning escapement target of 6,160,000 spawners and Johnstone Strait diversion rate of 78%. The median forecast abundance of Fraser pink salmon was 16,318,000 fish, with a spawning escapement target of 6,000,000 fish.

3. For Late-run sockeye, the Panel assumed a continuation of the early upstream migration behaviour and associated high mortality that has occurred since 1996. Thus, the Late-run escapement target (excluding Birkenhead) was based on an exploitation rate limit of 15%, leaving 85% of the run for spawning. For Canadian fisheries, the exploitation rate on Cultus sockeye was further constrained to 10-12%. Because of the low expected abundance of Late-run sockeye, only limited research studies were conducted to help determine the cause(s) of early river-entry behaviour.

4. Pre-season spawning escapement goals were 194,000 Early Stuart, 362,000 Early Summer, 5,262,000 Summer, 132,000 Birkenhead and 210,000 Late-run sockeye, for a total of 6,160,000 fish.

5. Pre-season Management Adjustments of 62,000 Early Stuart, 173,000 Early Summer and 766,000 Summer-run fish were adopted, based on long-range forecasts of river discharges and temperatures.

6. Projected TACs available for international sharing based on the median abundance forecasts were 4,885,000 sockeye and 10,308,000 pink salmon (Table 1). United States' shares of these TACs were 16.5% for sockeye and 25.7% for Fraser pinks. There were no paybacks owed for either species from previous years.

7. Pre-season modeling showed that it was unlikely that the available Summer-run TAC would be harvested due to mixed stock fishery constraints associated with escapement targets for Early Summer and Late-run stocks.

8. The Panel adopted a management plan and fishery regime before the fishing season (see Appendices for the Principles and Constraints, Guidelines to Address Late Run Concerns, Panel Management Process, and Regulations (Appendices D-G).

In-season Management Considerations

9. A unique aspect of the 2005 Fraser sockeye return was their extremely late marine migration timing: 13 days later than average for Early Stuart (August 16), 29 days for Early Summer (August 21), 15 days for Summer-run stocks (August 23) and 9 days for Late-run stocks (August 12 for Harrison and August 30 for Weaver/Late) (Figure 3, Table 2). The 50% dates for Early Stuart and Summer runs were about a week later than the previous record while the Early Summer date was about 2 weeks later than the record. In contrast, Fraser River pink salmon returned earlier than normal (6 days earlier than average) (Figure 4). The late sockeye return delayed fisheries in both countries, exposed the Early Summer run to warmer than forecasted water temperatures which resulted in larger management adjustments, led to a pattern of delayed and then increasing Summer-run abundance estimates, increased the overlap between Summer and Late-run migrations, and generally restricted opportunities for directed harvest of Summer-run stocks.

10. The almost complete overlap of Late-run sockeye and pink salmon (Figure 4) in the Fraser River caused two additional problems. First, the large abundance of pink salmon resulted in biased test fishery-based estimates of species composition, which led to substantially overestimated sockeye escapement past Mission. The in-season estimate of Mission escapement was 8,343,000 fish compared to a bias-corrected estimate of 5,686,000 fish, a difference of 2,624,000 fish or 31% (Table 7). While the likelihood of this bias was identified in-season, the magnitude could not be determined until after the season. Second, the overlapped migrations presented very limited harvest opportunities for pink salmon because of Late-run conservation concerns.

Run Size, Catch and Escapement

11. The total return of adult Fraser sockeye was 7,024,000 fish (Table 9), 44% lower than the median pre-season forecast. Returns of all ages totalled 7,077,000 fish, including 220,000 Early Stuart, 622,000 Early Summer, 5,400,000 Summer, 164,000 Birkenhead and 671,000 Late-run sockeye (Table 8). Among Summer-run stocks, Quesnel sockeye dominated the returns, followed by Chilko sockeye. The largest Late-run return was Harrison sockeye, followed by Weaver/Cultus sockeye.

12. Catches of Fraser River sockeye salmon in all fisheries totalled 1,755,000 fish, including 1,143,000 fish caught by Canada, 495,000 fish by the United States and 118,000 fish by test fisheries (Table 8). The Canadian catch included 129,000 fish in commercial, 956,000 fish in First Nations, 50,000 fish in recreational and 7,000 fish in ESSR (excess salmon to spawning requirements) fisheries. In Washington, Treaty Indian fishers caught 140,000 fish and Non-Indian fishers caught 61,000 fish, while 294,000 Fraser sockeye were harvested in Alaska. The small commercial harvest in Canada was a result of the extremely late marine timing of sockeye combined with additional domestic constraints associated with the Cultus exploitation rate limit of 10-12%. Commercial fishery catches in both countries summed to 629,000 fish.

13. DFO's estimates of spawning escapements to streams in the Fraser River watershed totalled 3,308,000 adult sockeye (Table 9). Included in this total are 553,000 Quesnel sockeye that were not directly enumerated, but rather projected based on relative abundances of Quesnel component stocks in the brood year (2001) compared to enumerated stocks in 2005. The total escapement was 37% lower than the brood year escapement of 5,257,000 adults (Table 12). Compared to the brood year, adult spawning escapements were 42% lower for Early Stuart, 25% lower for Early Summer, 48% lower for Summer, 4% higher for Birkenhead and 970% higher for Late-run stocks. The large Late-run escapement was due to the largest escapement to the Harrison system (389,000 fish) since spawning records began in 1952, and was 8.5 times larger than the previous largest escapement to this system. The spawning success of female sockeye in the Fraser watershed averaged 99%.

14. Returns of Fraser River pink salmon totalled 10,000,000 fish, or 39% below the median run-size forecast. DFO did not conduct an escapement enumeration program for Fraser River pink salmon in 2005. With a run size of 10,000,000 fish and estimated catch of 1,060,000 fish, the implied escapement was 8,940,000 fish (Tables 8 and 9).

15. Catches of Fraser River pink salmon totalled 1,060,000 fish, including 637,000 by Canada, 338,000 by the United States and 85,000 by Panel-approved test fisheries (Table 8). Included in the Canadian total were 125,000 fish caught by commercial, 448,000 fish caught by First Nations and 64,000 fish caught by recreational fisheries. In the United States, 183,000 pink salmon were harvested in Treaty Indian fisheries, 134,000 in Non-Indian fisheries and 22,000 in recreational fisheries.

16. Annual diversion rates through Johnstone Strait were 74% for Fraser sockeye and 70% for Fraser pink salmon.

Achievement of Objectives

17. In order of descending priority, the goals of the Panel are to achieve the targets for spawning escapement, international sharing of the TAC and domestic catch allocation. In 2005, an additional objective was to obtain a Late-run exploitation rate of no more than 15%.

18. In-season management is based on targets for potential spawning escapement (i.e., spawning escapement target plus management adjustment). In-season estimates of potential spawning escapement (i.e., Mission escapement minus in-river catches above Mission) were relatively close to the targets for Early Stuart (19,000 fish under) and Early Summer (21,000 fish under), and substantially over the targets for Summer (2,019,000 fish over), Birkenhead (61,000 fish over) and Late-run sockeye (201,000 fish over) (Table 15). These results are mainly due to harvest constraints directed at protecting Late-run sockeye stocks.

19. Upriver estimates of adult spawning escapement were below post-season targets for all runs: Early Stuart - 72,000 fish under, Early Summer - 97,000 fish under, Summer - 920,000 fish under and Birkenhead - 44,000 fish under (Table 16). (Late-run escapement is not reviewed in the same way because it was managed to an exploitation rate limit rather than an escapement target.) In total, spawning ground estimates were 1,133,000 fish or 29% less than the target. In contrast, the spawning escapement target for pink salmon was exceeded by almost 3,000,000 fish. Sockeye escapements were below targets because: 1) in-season run-size and TAC estimates were too high as a consequence of overestimated sockeye proportions obtained from in-river test fisheries and that were applied to Mission estimates of abundance, and 2) differences between in-season and post-season escapement estimates were higher than accounted for by in-season management adjustments derived from environmental models (Table 18).

20. A catch of 73,000 Late-run sockeye in all fisheries represents an overall exploitation rate of 12%, and therefore less than the 15% limit for Late-run sockeye (94,000 fish, Table 19). Using the catch and abundance of the Weaver/Cultus stock group as an index for Cultus Lake salmon, the Cultus exploitation rate of 14% (Table 9) exceeded the Canadian objective (10-12%).

21. Based on the TAC calculation method set out in the revised Annex IV, Chapter 4 of the Pacific Salmon Treaty, neither country caught their available TACs. United States catches represent underages of 236,000 Fraser sockeye and 687,000 pinks, and Canadian catches represent underages of 1,467,000 sockeye and 2,327,000 pinks (Table 20).

22. In United States Panel Areas, Treaty Indian and Non-Indian fishers were well short of their shares of the U.S. TAC for both Fraser sockeye and pink salmon (Tables 21 and 23). Treaty Indian fishers were 156,000 sockeye and 330,000 pink salmon short, while Non-Indian fishers were 80,000 sockeye and 357,000 pinks under.

23. In Canada, Area B purse seines were 6,600 fish under, Area D gillnets were 24,000 fish over, Area E gillnets were 23,000 fish under and Area H trollers were 5,500 fish over their respective allocations of the commercial catch of Fraser sockeye (Table 22). For Fraser River pink salmon, Area B purse seines were 3,200 fish over, Area D gillnets were 4,000 fish over, Area E gillnets were 2,500 fish over, Area G trollers were 15,000 under and Area H trollers were 5,600 fish over their respective allocations (Table 24).

24. The restrained fisheries in 2005 resulted in moderate by-catches of non-Fraser sockeye and pink salmon and other salmon species in commercial net fisheries regulated by the Fraser River Panel. Catches of non-Fraser sockeye and pink salmon totalled 1,100 and 23,000 fish, respectively (Table 25). Catches of other Fraser and non-Fraser salmon included 4,400 chinook, 1,500 coho, 180 chum salmon and 10 steelhead.

Allocation Status

25. As a result of the revised Annex IV, Chapter 4 and the Commission Guidance (February 2005), there were no paybacks carried forward to 2005, and no paybacks generated in 2005 to apply in future years for either sockeye or pink salmon (Table 26).

II. FRASER RIVER PANEL

In 2005, the Panel operated under the terms of Annex IV, Chapter 4 of the Pacific Salmon Treaty between Canada and the United States (U.S.) (Appendix A) and the "Commission Guidance to the Fraser River Panel" (Appendix B), as revised in February 2005. The Treaty specifies that the Fraser River Panel is responsible for in-season management of commercial fisheries that target Fraser River sockeye and pink salmon within the Panel Area (Figure 1), including net fisheries in both countries and the Canadian inside (Strait of Georgia) troll fishery. The development of management approaches for directed harvest of other species and stocks intercepted in south coast areas is the responsibility of the Southern Panel and the Commission. Regulation of Southern Panel related fisheries is the responsibility of the appropriate agencies in each country.

Prior to the fishing season, the Fraser River Panel recommends a fishery regime and a management plan for Panel Area fisheries, which are approved by the Commissioners of the Pacific Salmon Commission (PSC). The plan is based on: (1) abundance and timing forecasts and escapement targets for Fraser River sockeye and pink salmon stocks provided by Canada's Department of Fisheries and Oceans (DFO); (2) international catch allocation goals set by the Treaty; (3) domestic catch allocation goals of each country; (4) management concerns for other stocks and species identified by each country; and (5) historic patterns in migration and fisheries dynamics. In descending priority, the objectives that guide the Panel's decision-making are to: (1) achieve the spawning escapement targets; (2) meet international catch allocation goals; and (3) meet domestic catch allocation objectives. Conservation concerns for other species and stocks that may occur as by-catch in fisheries directed at Fraser sockeye and pink salmon are generally addressed through domestic measures with some international coordination.

The pre-season management plan identifies the approximate pattern of fishery openings required to achieve the Panel objectives given pre-season expectations. Using in-season commercial and test fishing data and analyses from PSC staff (Staff), the Panel responds to deviations from pre-season expectations in the weekly fishing plans they develop. The Fraser River Panel Technical Committee (see below) works in conjunction with Staff (Appendix L) to facilitate Panel activities by providing their respective National sections with technical advice and ensuring timely exchange of data between Staff and the Parties.

2005 Technical Committee Members

Canada	United States
L. Jantz, Co-Chair *Fisheries and Oceans Canada*	G. Graves, Co-Chair *Northwest Indian Fisheries Commissions*
A. Cass *Fisheries and Oceans Canada*	K. Adicks *Washington Department of Fish and Wildlife*
R. Goruk *Fisheries and Oceans Canada*	C. Wright *National Marine Fisheries Service*
J. Grout *Fisheries and Oceans Canada*	
M. Staley *First Nations Advisor*	

III. PANEL MANAGEMENT ACTIVITIES

A. Pre-season Planning

In 2005, pre-season fishery planning focused on Late-run sockeye issues. First, the 2005 Late-run return was forecast to be much smaller than the cycle-year average, because high en route and pre-spawning mortality associated with extremely early river entry of Late-run stocks in 2001 resulted in very low brood year spawning escapements. Second, Canada's Minister of Fisheries and Oceans committed in 2005 to provide special protection to Cultus sockeye from harvest and other threats to its long term viability, in lieu of legally listing it as endangered under Canada's Species at Risk Act. Third, the forecasted low abundance of Late-run sockeye relative to Summer-run sockeye generated concerns about the capability of Staff to directly assess Late-run catch and abundance in-season. In its pre-season deliberations, the Panel recognized the likely continuation of the early upstream migration behaviour of Late-run sockeye, and the probability that subsequent en route and pre-spawning losses would occur. Due to low expected abundances, concerns for Cultus sockeye and limited assessment capability, the Panel adopted a very conservative plan to limit incidental harvest of Late-run sockeye.

Canada presented the Panel with preliminary run-size forecasts for Fraser River sockeye and pink salmon in February, and in April provided revised forecasts of the probabilities (25%, 50%, 75%, 80% and 90%) that the runs would exceed specific run sizes (Appendix C, Table 1). For planning purposes, however, the Panel used the median (i.e., 50% probability level) forecasts of 12,548,000 Fraser River sockeye and 16,318,000 pink salmon (Table 1), indicating equal probabilities that the actual runs would be above or below the pre-season forecasts.

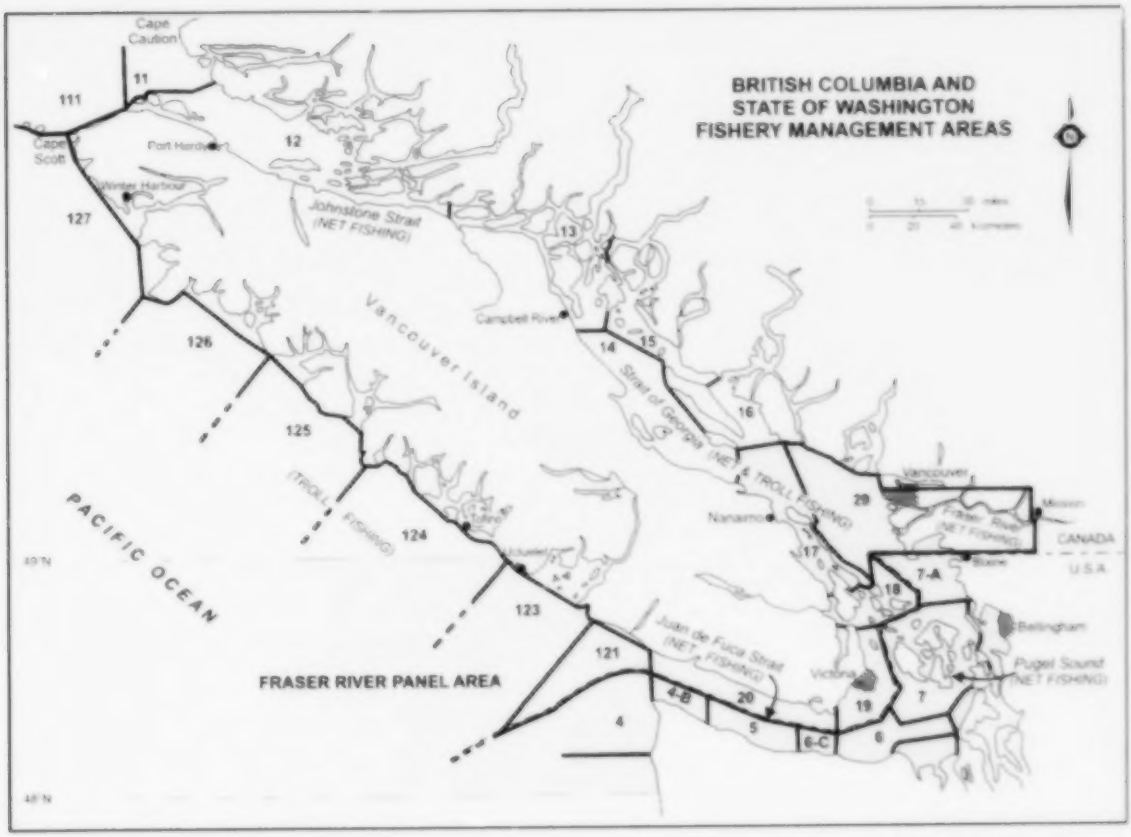


Figure 1. Fishery management areas and commercial gear used in the Fraser River Panel Area and Canadian south coast waters.

Table 1. Pre-season forecasts of total runs, spawning escapement targets and other deductions, and total allowable catches of Fraser River sockeye and pink salmon in 2005.

Management Group	Forecast Run (median)	Deductions				Total Allowable Catch
		Spawning Escapement Target	Management Adjustment	Aboriginal Fishery Exemption	Test Fishing	
Sockeye Salmon						
Early Stuart	258,000	194,000	62,000	0	2,000	0
Early Summer	718,000	362,000	173,000	22,900	10,000	150,100
Summer	11,048,000	5,262,000	766,000	369,800	88,000	4,562,200
Birkenhead	277,000	132,000	0	3,700	1,000	140,300
Late	247,000	210,000	0	3,600	1,000	32,400
Total	12,548,000	6,160,000	1,001,000	400,000	102,000	4,885,000
Pink Salmon						
Total	16,318,000	6,000,000	n/a	n/a	10,000	10,308,000

In April, Canada presented the Panel with background information on a proposed new approach for establishing spawning escapement objectives, called the "Spawning Escapement Initiative". The first element of the new approach was to employ a simulation model to explore the effects of different management objectives (e.g., ensure adequate spawner abundance while avoiding years of low catch) and different assumptions about stock dynamics. Secondly, the model results were reviewed in a multi-stage participatory process involving user group representatives, resulting in recommended harvest rules. These harvest rules specified a schedule of total allowable mortality rates ("TAM rules") at various abundance levels for each management group.

For 2005, Canada proposed to use guidelines derived from the Spawning Initiative to set escapement targets for Early Stuart, Early Summer and Summer-run sockeye. Birkenhead sockeye would be managed to the same percentage escapement target as Summer-run sockeye. The proposed target for Late-run sockeye would be similar to 2004, with a maximum exploitation rate of 15% for international fisheries (generating a de-facto escapement goal of 85%), but with a more restricted harvest (10-12%) within Canada for the Cultus component of Late-run sockeye. The spawning escapement goal for Fraser River pink salmon was 6,000,000 fish. In July, these targets were approved within Canada and adopted by the Panel. Age 3_1 sockeye (primarily Harrison) were not included in pre-season forecasts of Late-run abundance and were therefore excluded from the 15% exploitation rate limit adopted by the Panel, so age 3_1 sockeye were excluded from in-season assessments of Late-run exploitation rate against the limit. These age 3_1 sockeye were, however, included in assessments of catch, total run and overall exploitation rate.

In May and again in June, Staff provided the Panel with pre-season forecasts of "Differences Between Estimates" (DBEs) and "Management Adjustments" (MAs) for Early Stuart, Early Summer and Summer runs. DBEs are the historically observed differences between potential spawning escapement (Mission escapement minus catch above Mission) and spawning ground estimates of escapement. Sources for these DBEs include not only en route mortality, but also errors (variability) introduced through estimates of Mission escapement, spawning ground escapement, First Nations and recreational catches above Mission, and stock composition. These historical DBEs are a consistent feature for Early Stuart and Early Summer-run estimates, occurring almost every year. For these two management groups and the Summer run too, the DBEs are also related to adverse discharge and temperature conditions in the Fraser River during upstream migration. Models have been developed that use long-range forecasts of river conditions to predict not only what the DBEs are likely to be, but also how many additional fish should be allowed to escape to achieve the spawning escapement targets with more certainty, i.e., Management Adjustments (MAs). The models that generate these estimates are referred to as "Management Adjustment" or MA models. In 2005, forecasts were for lower than normal discharge and warmer than normal water temperatures in the Fraser River during the sockeye migration period, generating the predicted MAs shown in Table 1.

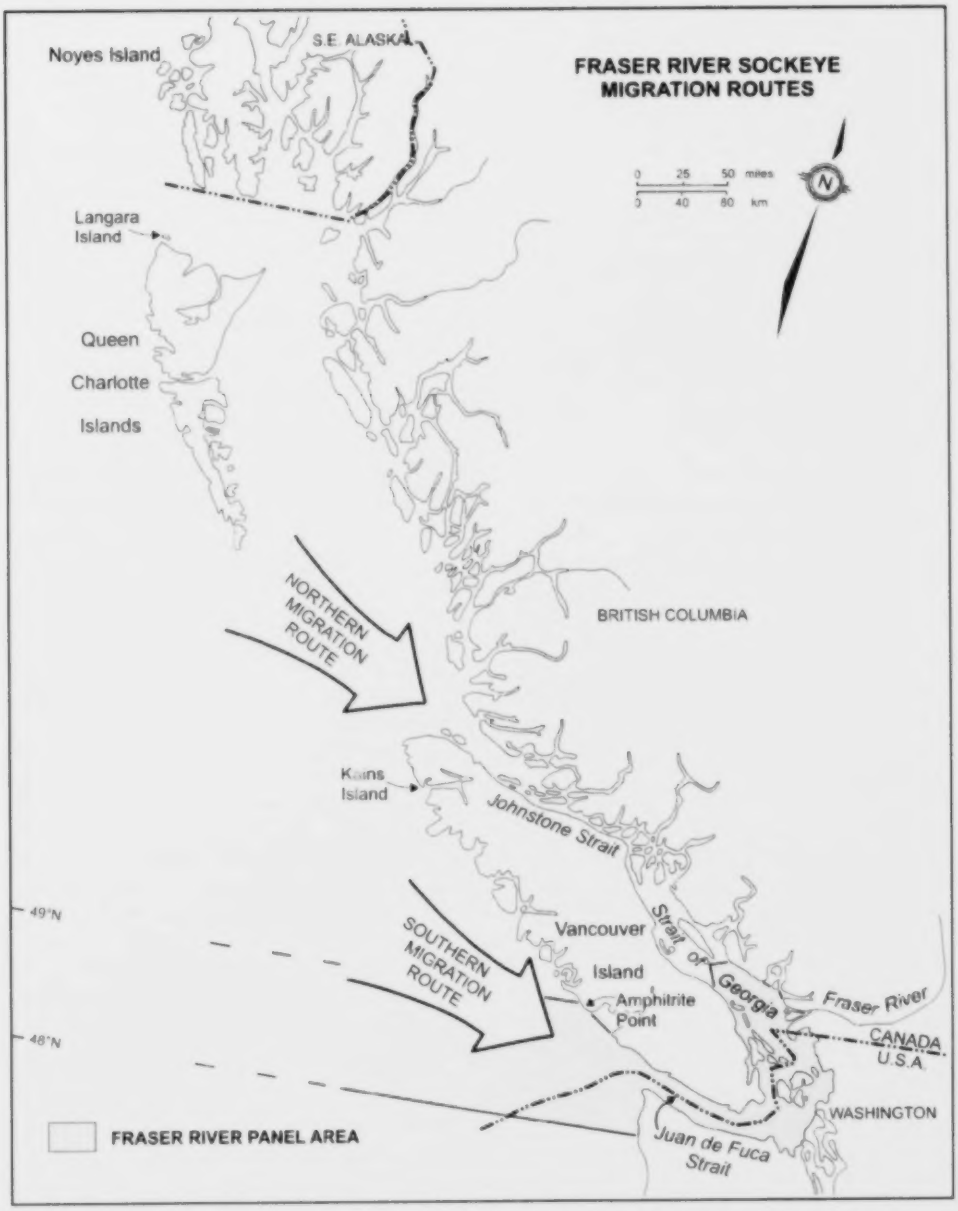


Figure 2. The northern (Johnstone Strait) and southern (Juan de Fuca Strait) routes for sockeye and pink salmon migrating to the Fraser River.

Pre-season expectations of migration parameters included a 78% diversion rate of Fraser sockeye through Johnstone Strait (Figure 2), and Area 20 migration dates of July 3 for Early Stuart, July 23 for Early Summer, August 8 for Summer, August 13 for Birkenhead and August 14 for Lates (Table 2). These Area 20 dates are indices of marine migration timing, and represent the historical average date when 50% of the total run would have entered Juan de Fuca Strait (Canadian Area 20) if the entire run had migrated via that route. The assumptions for pink salmon were a diversion rate of 60% and a 50% Area 20 date of August 31. Projected daily abundance patterns generated from these dates are shown in Figures 3 and 4.

TAC and international harvest shares in 2005 were to be calculated according to Annex IV, Chapter 4 of the Pacific Salmon Treaty (Appendix B) and the "Commission Guidance to the Fraser River Panel" (Appendix C) as revised in February 2005. U.S. (Washington) shares were

16.5% and 25.7%, respectively, of the Total Allowable Catches (TACs) of Fraser River sockeye and pink salmon. Pre-season TAC projections based on the median (50% probability level) run-size forecasts and the agreed escapement targets, management adjustments, Aboriginal Fishery Exemptions and expected test fishing catches are shown in Table 1. Corresponding allocations of the pre-season TAC to Washington fishers were 806,000 sockeye and 2,649,000 pink salmon. In terms of domestic goals, Treaty Indian fishers were allocated 67.7% and Non-Indian fishers the remaining 32.3% of the U.S. share of Fraser sockeye. The U.S. share of Fraser pinks was to be shared equally between Treaty Indian and Non-Indian fishers.

Within Canadian non-commercial sectors, pre-season sockeye allocation targets were 749,000 fish for in-river First Nations and 250,000 fish for marine First Nations, and projected catches of 151,000 fish in in-river recreational and 10,000 fish in marine recreational fisheries, for a total catch of 1,160,000 fish. In the commercial sector the target of 3,319,000 fish was divided as follows: 48% for Area B purse seines, 14.5% for Area D gillnets, 26.5% for Area E gillnets, 0% for Area G trollers and 11% for Area H trollers. Commercial allocations of pink salmon were 70% for Area B purse seines, 4% for Area D gillnets, 1% for Area E gillnets, 12% for Area G trollers and 13% for Area H trollers.

Pre-season management plans for Panel Area fisheries were developed by the Panel using the Fishery Simulation Model[1]. This model helps the Panel to evaluate the impacts of various fishery options on the achievement of the management objectives. Inputs into the model include the forecasted abundances, migration timing, diversion rates and management adjustments, and the objectives for spawning escapement and catch allocation described above. To model Late-run impacts, a 50% upstream migration date past Mission of August 24 was used, based on historical Late-run marine timing on the Weaver-dominated cycle lines (2000 and 2001) and on Late-run upstream migration behaviour in recent years. In addition, an en route mortality of 81% was assumed, as derived from a Late-run MA model that bases its predictions on the Mission timing date. The data used in the MA model were also confined to Weaver-dominated cycle lines, which enabled the Panel to account for the larger en route losses that have occurred in Weaver-dominated years compared to Late Shuswap-dominated years.

It was recognized that the Panel would be very unlikely to modify Late-run catch objectives in-season due to the likelihood that Late-run abundance and in-river migration timing could not be estimated until after fisheries were complete. In terms of measuring progress towards the catch limits, the Panel preferred a direct approach in 2005, following the unsuccessful experience of attempting to estimate Late-run impacts indirectly in 2004. Simulation analyses conducted by Staff indicated that DNA methodology could provide relatively unbiased estimates of Weaver group proportions and so the Panel chose to use Weaver as the index stock in calculations of Late-run catch and abundance.

As in recent years with significant Late-run conservation concerns, simulation modelling focussed on harvesting Summer-run sockeye while protecting weaker co-migrating sockeye stocks. Simulation results indicated significant constraints to the harvest of Summer-run TAC, with the projected Summer-run catch significantly below the target. The primary limitations on Summer-run harvest were the low available harvest of Early Summer sockeye at the beginning of the Summer-run period and the very low available harvest of Late-run sockeye during the latter portion of the Summer-run migration. These constraints resulted in an expectation that the window of opportunity for Summer-run directed fisheries would be very narrow.

In June and July, the Panel adopted a management plan, which included the "2005 Fraser River Panel Management Plan Principles and Constraints", "Guidelines for Pre-Season Fraser Sockeye Fishing Plans to Address Late Run Concerns", "2005 Fraser Panel Management Process" and "2005 Regulations" (Appendices D, E, F and G). In the pre-season plan, fisheries in U.S. Panel Areas were expected to start during the week of July 24 - 30 in Areas 4B, 5 and 6C, and the week of July 31 - August 6 in Areas 6, 7 and 7A. Canadian Panel Area fisheries in Areas 17, 18 and 29 (troll) were expected to open during the week of July 24 - 30, while net fisheries in Area 29 and an assessment fishery in Area 20 were expected to open during the week of July 31 - August

[1] Cave, J.D. and W.J. Gazey. 1994. A pre-season simulation model for fisheries on Fraser River sockeye salmon (O. nerka). Can. J. Fish. Aquat. Sci. 51(7): 1535-1549.

6. If early in-season estimates of the abundance and timing of Early Summer and Summer-run sockeye differed from the forecasts, the start and duration of fisheries were expected to be modified accordingly.

During the pre-season planning process, the Parties identified conservation concerns for other stocks and species. In Canada, these included Skeena and Thompson coho salmon, Lower and Upper Georgia Strait coho salmon, Johnstone Strait coho salmon, summer-run chum salmon, Thompson River steelhead and West Coast Vancouver Island and Harrison River chinook salmon. The species and stocks identified by the U.S. included Hood Canal summer-run chum and Puget Sound chinook salmon.

B. In-season Management

The Fraser River Panel convened 26 times between June 29 and September 16, to discuss run status and enact In-season Orders (Appendix H) to regulate fisheries directed at Fraser River sockeye and pink salmon harvest in Panel Areas.

Fisheries management in 2005 was more difficult than expected. Unusual migration patterns and assessment issues made it difficult for the Panel to achieve its goals. The arrival of Fraser River sockeye in marine assessment areas (i.e., Juan de Fuca and Johnstone Straits) was extremely late, ranging from 9 days (Late-run sockeye) to 29 days (Early Summer-run sockeye) later than expected (Figure 3), which increased the migration overlap among management groups and hindered the Panel's ability to access Summer-run sockeye for harvest. While Fraser River water temperatures were not extreme in 2005, they were sufficient to generate a pattern of increasing management adjustments for Early Summer-run sockeye that further limited harvest opportunities. The very late timing of Summer-run sockeye resulted in underestimates of Summer-run abundance during much of the period when fishing opportunities were anticipated under the pre-season plan. By the time Summer-run estimates increased, Late-run sockeye were also increasing in abundance. The combination of late arrival timing, negative bias in run-size assessments and increased overlap in Summer and Late-run migrations resulted in very low exploitation rates on Summer-run stocks.

In contrast to the late arrival of sockeye salmon, Fraser River pink salmon arrived earlier than normal. This resulted in highly overlapped sockeye and pink migrations (Figure 4) and limited harvest opportunities for Fraser pinks due to by-catch concerns for Late-run sockeye. The overlapping upstream migrations of sockeye and pink salmon also created problems in obtaining species composition estimates from in-river test fisheries, which are applied to total salmon estimates from the Mission hydroacoustic program to estimate the daily passage of sockeye and pink salmon.

The main events of the season are summarized below on a weekly basis. Table 2 shows the pre-season assumptions and post-season estimates, followed by in-season estimates and ending with the final in-season estimates when control of the last U.S. Panel Area was relinquished and TAC calculations were finalized. This synopsis focuses on analyses and recommendations by Staff and on Panel decisions.

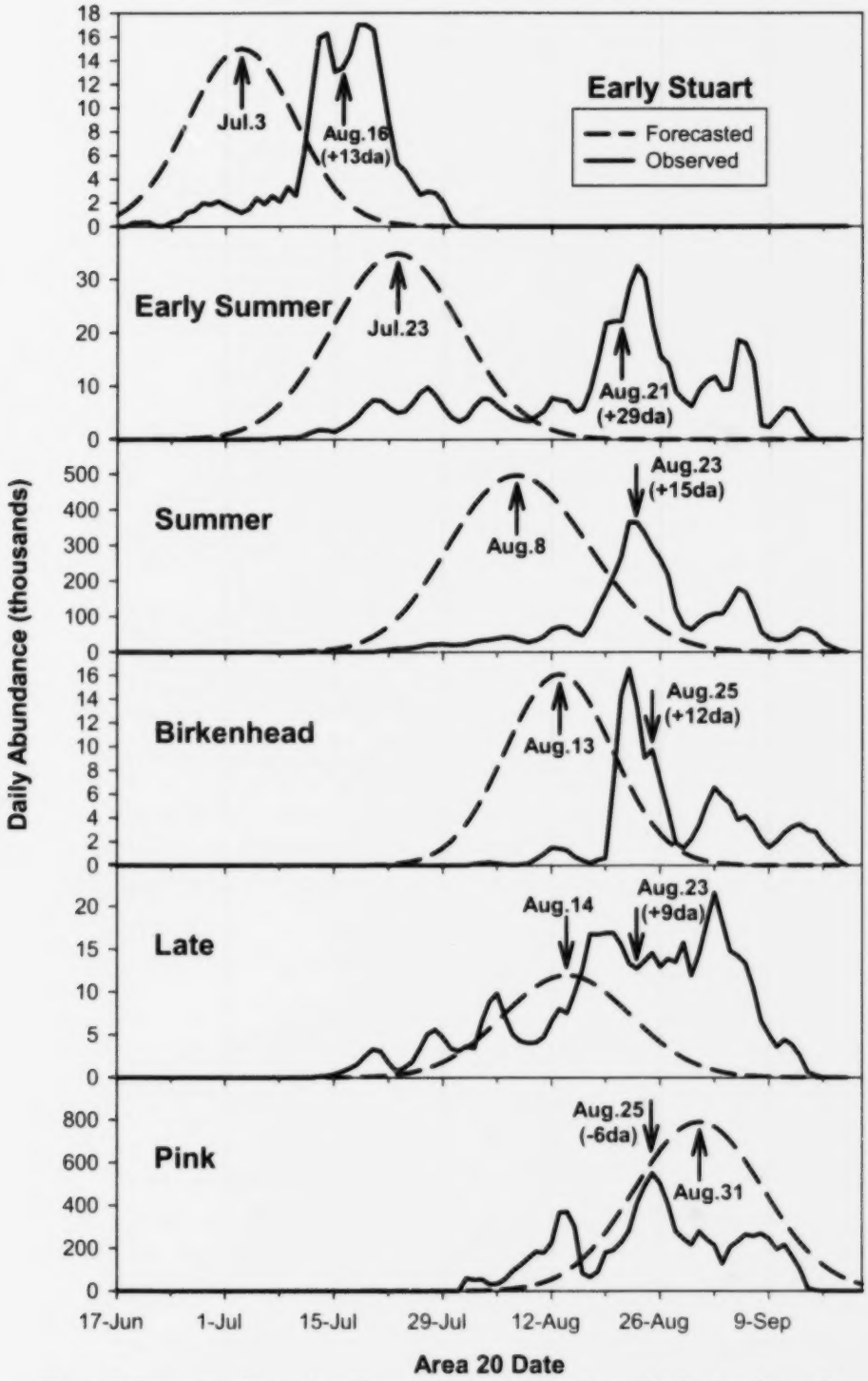


Figure 3. Pre-season forecasts and post-season reconstructions of daily abundance of Fraser River sockeye and pink salmon in 2005 (Area 20 date), including the forecasted and observed 50% dates and number of days difference with the pre-season expectations. This figure shows the lateness, low abundance and high degree of overlap of sockeye management groups compared to pre-season expectations.

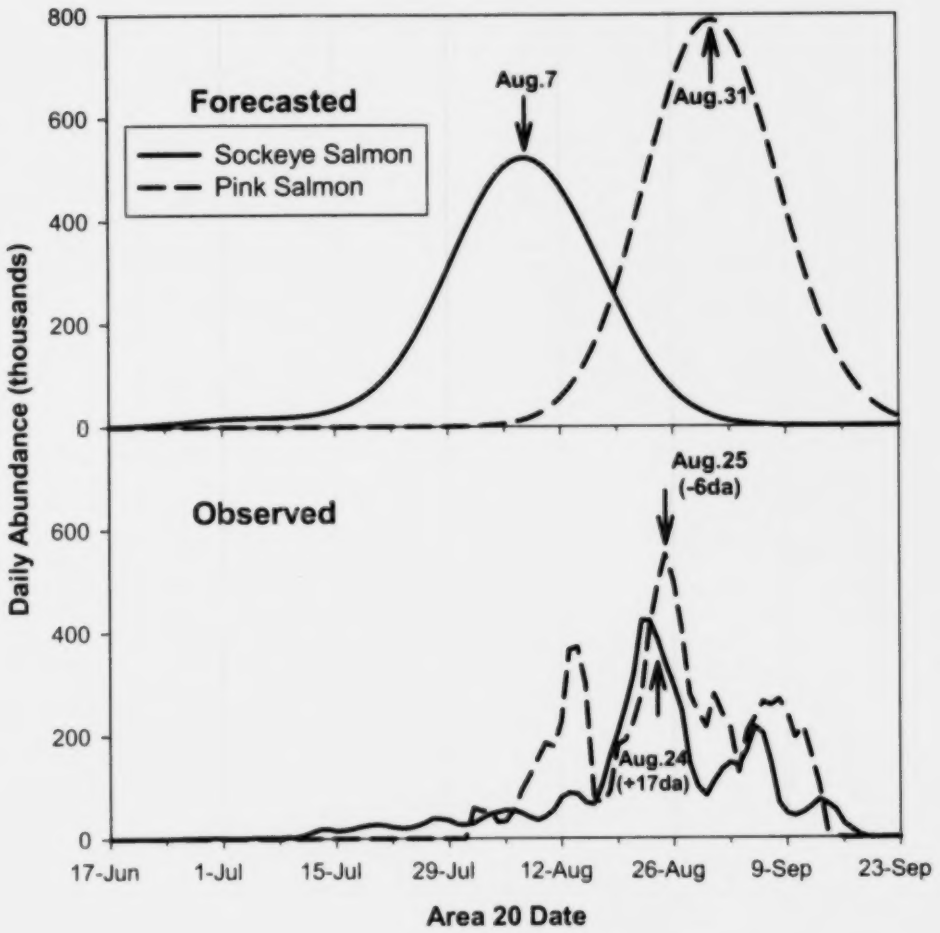


Figure 4. Pre-season forecasts and post-season reconstructions of daily abundance of Fraser River sockeye and pink salmon in 2005 (Area 20 date), including the forecasted and observed 50% dates and number of days difference with the pre-season expectations. This figure shows the low abundance and overlapped migrations of these species compared to pre-season expectations.

The first in-season meeting of the Panel took place on June 29. Staff reported that test-fishing catches were below pre-season expectations for the Early Stuart stock group. While the small catches could be related to late-timing, indices of abundance in other marine and Fraser River areas were generally poor for Fraser sockeye and also for other species. During the week of July 3-9, catches of Early Stuart and Lake Washington sockeye in the Area 20 and Whonnock test fisheries continued to fall short of expected levels and fish sizes were small, averaging 4.8 - 5.0 lbs per fish. Catches in the Whonnock test fishery were extremely low, due in part to a high incidence of seal predation. Meanwhile, small escapements were reported from the Mission hydroacoustic program (13,000 sockeye through July 7) and sockeye counts at Hells Gate indicated a lack of migrating sockeye. In addition, sockeye returns appeared to be low for Lake Washington, Barkley Sound, Nass River and Skeena River. The Early Stuart run appeared unlikely to reach the 75% probability level forecast of abundance (175,000 fish), with preliminary estimates ranging between 30,000 and 50,000 fish. Because all fisheries remained closed, Staff suggested the Panel defer formal adoption of a lower run size until more data were available. Water temperatures and discharge levels in the Fraser River continued to be relatively benign for fish migration (16°C, 5,300 m^3/s).

Between July 10-16, sockeye catches in the Area 20, Area 12 and Whonnock test fisheries remained extremely low relative to pre-season expectations. Similarly, low escapement estimates past Mission and low sockeye counts at Hells Gate suggested a very poor return of Early Stuart sockeye. The escapement past Mission through July 14 was estimated at 27,100 sockeye, including 25,800 Early Stuart and 1,300 Early Summer-run sockeye. Average weight data for Fraser River sockeye remained below average. DNA samples were comprised predominantly of Early Stuart sockeye, with some Early Summer fish starting to appear. However, the low proportions of Early Summer stocks indicated that the marine timing of both stock complexes were potentially much later than forecast. Reports of sockeye abundance from other systems were variable, with Lake Washington sockeye tracking well below the forecast abundance, Barkley Sound sockeye returning marginally below the forecast and Alaskan stocks in Bristol Bay above forecast levels. Based on Staff's recommendation, the Panel adopted a provisional run-size estimate of 35,000 fish for the Early Stuart run. Staff also reported assessment results that indicated Early Summer-run stocks were significantly later and/or weaker than forecasted pre-season. Environmental conditions in the Fraser River continued to be satisfactory for sockeye migration (< 16°C, < 6,000 m^3/s) and near the long-term means. The Panel adopted a slightly higher Early Stuart MA factor (0.52), however, the Early Stuart TAC remained at zero since the entire run was required for escapement.

By the end of the week of July 17-23, sockeye abundance in both Area 20 and Area 7 test fisheries had increased while catches in the Area 12 test fishery remained poor, indicating that most sockeye were migrating via Juan de Fuca Strait. The proportion of age 5_2 sockeye in marine test fishery catches was higher than in previous weeks, however, age-specific sockeye weights remained below average. Although seal predation in the Fraser River continued to impact test fishery catches, sockeye catches at Whonnock had increased. The estimated escapement of sockeye past Mission through July 21 included 93,000 Early Stuart, 14,000 Early Summer and 1,000 Summer-run sockeye. DNA samples from both marine and river test fisheries were still comprised predominantly (>80%) of Early Stuart sockeye, providing further evidence of their extremely late migration timing. Meanwhile, abundances of Early Summer and Summer-run sockeye in catch and escapement were far below expectations if migration timing was close to normal. In contrast to the general trend towards much later than normal timing, relatively high fractions of age 4_1 Harrison River were appearing in samples from Area 20, possibly indicating early marine timing. Based on an increase in accounted (i.e., catch to date plus escapement past Mission) Early Stuart sockeye, the Panel approved a run-size increase to 130,000 fish. The Panel also adopted an increased Early Stuart MA factor of 0.68, due to forecasted water temperatures above 18°C in the coming days. The TAC remained at zero, however. Staff informed the Panel that the Early Summer run was tracking seven to eight days late if the abundance was to reach even the 75% probability forecast level (391,000 fish). No fisheries were approved by the Panel due to low abundances of Early Summer and Summer-run sockeye in marine areas, and because the escapement of these stocks past Mission remained well below expectations for the date.

Between July 24-30, test fishing catches of sockeye salmon in Juan de Fuca and Johnstone Straits were variable, indicating a flat migration profile. Pink salmon catches in Johnstone Strait were building. Estimates of sockeye escapement past Mission were increasing, with 183,000 Early Stuart, 59,000 Early Summer and 19,000 age 4_2 Summer-run sockeye, and 17,000 Harrison 4_1 sockeye. Meanwhile, DNA samples from marine test fisheries showed a decline of Early Stuart sockeye, increased numbers of Early Summer sockeye and a broader array of Summer-run stocks. The proportion of age 5_2 sockeye continued to be higher than expected, relative to the forecast. Staff continued to interpret the data trends as indicative of later timing and lower abundance than forecast, with the exception of Harrison sockeye which appeared to be normally timed and showed a strong presence relative to the pre-season forecast. The Panel expressed concern about the elevated presence of Harrison River sockeye in recent samples. PSC staff noted the following points with respect to the presence of Harrison sockeye and their impact on Late-run management objectives: (1) for the purpose of in-season assessments, age 3_1 sockeye (primarily Harrison) would not count against the 15% Late-run harvest rate limit, but age 4_1 Harrison sockeye would count against it; (2) Harrison harvest impacts would not affect the 10%-12% Cultus harvest limit (Cultus was grouped with the Weaver group); and (3) the delay of marine area fisheries in response to late Summer-run timing would likely result in lower harvest impacts on Harrison sockeye relative to recent past years. DNA samples indicated the Early Stuart migration was nearly complete and the Panel approved an accounting-based run-size estimate (i.e., total catch

plus escapement past Mission) of 200,000 Early Stuart sockeye. Staff reported that due to their extreme late timing, it was too early to accurately update the run size of the Early Summer run, although preliminary estimates ranged between 220,000 and 540,000 fish. Based on the small proportions of Early Stuart sockeye remaining in Juan de Fuca Strait and building abundances of Early Summer and Summer-run stocks, the Panel approved the commencement of the Areas 4B, 5 and 6C Treaty Indian drift gillnet fishery. Canada announced that an Area D gillnet assessment fishery (10 boats in Area 12) had been approved.

During the week of July 31-August 6, Staff reported that the sockeye catch had declined in Juan de Fuca Strait test fisheries (Area 20 and Areas 4B, 5 and 6C). Similarly, catches in Johnstone Strait test fisheries were modest, indicating an overall weak migration pattern. Poor catches had also been reported in the Area D gillnet assessment fishery. The estimated escapement-to-date past Mission included 202,000 Early Stuart, 113,000 Early Summer, 136,000 Summer and 38,000 Harrison 4_1 sockeye. DNA samples confirmed the continued presence of Early Summer-run sockeye in both marine approach routes, with Summer-run sockeye dominating in all areas. Run-size estimates for Early Summer-run sockeye were below the 75% probability level forecast (391,000 fish) if the run was assumed to be eight days late, and the models indicated the run would have to be 12 days late to reach this abundance. Estimates for Summer-run sockeye ranged between the 50% and 75% probability level forecasts (with assumed timing of eight days late). Relatively high fractions of Harrison River sockeye were identified in in-river DNA samples, suggesting that Harrison fish were not delaying in the Strait of Georgia and were therefore more susceptible to higher mortality prior to spawning. Age composition data continued to show strong age 5_2 returns (brood year 2000) and weak age 4_2 returns (brood year 2001). Catches of age 4 sockeye in District 104, Alaska, had increased, suggesting that Fraser sockeye may be present in these waters. Staff also reported that water temperatures in the Fraser River at Qualark exceeded 18°C, and were therefore in the range where fish migration could be adversely impacted. Based on Staff recommendations, the Panel approved a reduced run-size of 250,000 fish and smaller MA factor for Early Summer-run sockeye compared to pre-season forecasts. Canadian Panel Areas remained closed to fishing, while in the U.S. the Panel opened then later in the week extended the Treaty Indian drift gillnet fishery in Areas 4B, 5 and 6C, based on the low number of participating vessels (five or fewer boats were expected to fish) and probable low catch impacts.

Between August 7-13, Staff reported that the sockeye migration appeared to be low but steady in Juan de Fuca Strait and building in Johnstone Strait. DNA samples showed that Summer-run sockeye dominated in all areas. One DNA sample from Area 20 contained a surprising 32% Harrison River sockeye, while an Area 12 sample showed weaker but significant proportions (8% Harrison). The continued low numbers of sockeye caught in Fraser River test fisheries complicated the estimation of species composition, thereby contributing to uncertainty in Mission sockeye escapement estimates. Staff noted that this estimation problem would become more severe if pink salmon migration into the river continued to increase. Scale samples indicated that age 5_2 sockeye proportions in marine samples were beginning to decline and age 4_2 proportions were increasing. Run-size estimates indicated that the Early Summer return would likely exceed 250,000 fish. Staff suggested and the Panel agreed to defer updating the Early Summer run size until a future meeting. Similarly, due to late migration timing it remained too early to update the Summer-run run size, although preliminary estimates ranged between 800,000 and 5,200,000 fish (with Area 20 timing of August 6 to 20). The Panel approved further extensions of the Treaty Indian drift gillnet fishery in Areas 4B, 5 and 6C throughout the week.

Table 2. Pre-season, post-season and in-season updates of run size, spawning escapement target and other TAC-related values, and migration timing and diversion rate for Fraser River sockeye and pink salmon in 2005. Final in-season values used for calculating the TAC and allocation status are at the bottom of the table.

Date		Management Group	Total Abundance	TAC					Available Harvest (incld. TF + AFE)	50% Migration Timing		Weekly JS Diversion Rate
				Spawning Escapement Target	Manage-ment Adjust.	Test Fishing	Aboriginal Fishery Exemption	Total Allowable Catch		Area 20	Mission	
June 25	Pre-season	Early Stuart	258,000	194,000	62,000	2,000	0	0	0	3-Jul	9-Jul	
		Early Summer	718,000	362,000	173,000	10,000	22,900	150,100	183,000	23-Jul	29-Jul	
		Summer	11,048,000	5,262,000	766,000	88,000	369,800	4,562,200	5,020,000	8-Aug	14-Aug	
		Birkenhead	277,000	132,000		1,000	3,700	140,300	145,000	13-Aug	19-Aug	
		Late	247,000	210,000		1,000	3,600	32,400	37,000	14-Aug	22-Aug	
		Sockeye	**12,548,000**	**6,160,000**	**1,001,000**	**102,000**	**400,000**	**4,885,000**	**5,385,000**	**7-Aug**		
		Pink	**16,318,000**	**6,000,000**		**10,000**		**10,308,000**	**10,318,000**	**31-Aug**		
	Post-season	Early Stuart	220,000	171,000	47,000	1,900	0		0	16-Jul	22-Jul	
		Early Summer	622,000	322,000	266,000	14,200	22,900		34,000	21-Aug	28-Aug	
		Summer	5,400,000	3,375,000	68,000	92,700	369,800		1,958,000	23-Aug	30-Aug	
		Birkenhead	164,000	103,000		2,200	3,700		61,000	25-Aug	1-Sep	
		Late	671,000	571,000		6,600	3,600		100,000	23-Aug	26-Aug	
		Sockeye	7,077,000	**3,971,000**	**381,000**	**117,600**	**400,000**		**2,153,000**	**24-Aug**		
		Pink	10,000,000	**6,000,000**		**10,000**			**4,000,000**	**25-Aug**		
Jun. 26-Jul. 2	In-season	Early Stuart	258,000	194,000	62,000	2,000	0	0	0	16-Jul	22-Jul	
		Early Summer	718,000	362,000	173,000	10,000	22,900	150,100	183,000	21-Aug	28-Aug	
		Summer	11,048,000	5,262,000	766,000	88,000	369,800	4,562,200	5,020,000	23-Aug	30-Aug	
		Birkenhead	277,000	132,000		1,000	3,700	140,300	145,000	25-Aug	1-Sep	
		Late	247,000	210,000		1,000	3,600	32,400	37,000	23-Aug	26-Aug	
		Sockeye	12,548,000	6,160,000	1,001,000	102,000	400,000	4,885,000	5,385,000			
		Pink	16,318,000	6,000,000		10,000		10,308,000	10,318,000			
July 12	In-season	Early Stuart	35,000	33,000	1,000	1,000	0	0	0	16-Jul	22-Jul	
		Early Summer	718,000	362,000	173,000	10,000	22,900	150,100	183,000	21-Aug	28-Aug	
		Summer	11,048,000	5,262,000	766,000	88,000	369,800	4,562,200	5,020,000	23-Aug	30-Aug	
		Birkenhead	277,000	132,000		1,000	3,700	140,300	145,000	25-Aug	1-Sep	
		Late	247,000	210,000		1,000	3,600	32,400	37,000	23-Aug	26-Aug	
		Sockeye	12,325,000	5,999,000	940,000	101,000	400,000	4,885,000	5,385,000			44%
		Pink	16,318,000	6,000,000		10,000		10,308,000	10,318,000			
July 22	In-season	Early Stuart	130,000	110,000	19,000	1,000	0	0	0	16-Jul	22-Jul	
		Early Summer	718,000	362,000	173,000	10,000	22,900	150,100	183,000	21-Aug	28-Aug	
		Summer	11,048,000	5,262,000	766,000	88,000	369,800	4,562,200	5,020,000	23-Aug	30-Aug	
		Birkenhead	277,000	132,000		1,000	3,700	140,300	145,000	25-Aug	1-Sep	
		Late	247,000	210,000		1,000	3,600	32,400	37,000	23-Aug	26-Aug	
		Sockeye	12,420,000	6,076,000	958,000	101,000	400,000	4,885,000	5,385,000			40%
		Pink	16,318,000	6,000,000		10,000		10,308,000	10,318,000			
July 26	In-season	Early Stuart	185,000	148,000	36,000	1,000	0	0	0	16-Jul	22-Jul	
		Early Summer	718,000	362,000	173,000	10,000	22,900	150,100	183,000	21-Aug	28-Aug	
		Summer	11,048,000	5,262,000	766,000	88,000	369,800	4,562,200	5,020,000	23-Aug	30-Aug	
		Birkenhead	277,000	132,000		1,000	3,700	140,300	145,000	25-Aug	1-Sep	
		Late	247,000	210,000		1,000	3,600	32,400	37,000	23-Aug	26-Aug	
		Sockeye	12,475,000	6,114,000	975,000	101,000	400,000	4,885,000	5,385,000			40%
		Pink	16,318,000	6,000,000		10,000		10,308,000	10,318,000			
July 29	In-season	Early Stuart	200,000	158,000	41,000	1,000	0	0	0	15-Jul	21-Jul	
		Early Summer	718,000	362,000	173,000	10,000	22,900	150,100	183,000	31-Jul	6-Aug	
		Summer	11,048,000	5,262,000	766,000	88,000	369,800	4,562,200	5,020,000	23-Aug	30-Aug	
		Birkenhead	277,000	132,000		1,000	3,700	140,300	145,000	25-Aug	1-Sep	
		Late	247,000	210,000		1,000	3,600	32,400	37,000	23-Aug	26-Aug	
		Sockeye	12,490,000	6,124,000	980,000	101,000	400,000	4,885,000	5,385,000			40%
		Pink	16,318,000	6,000,000		10,000		10,308,000	10,318,000			

Table 2, continued.

Date		Management Group	Total Abundance	TAC: Spawning Escapement Target	TAC: Management Adjust.	TAC: Test Fishing	TAC: Aboriginal Fishery Exemption	TAC: Total Allowable Catch	Available Harvest (incld. TF + AFE)	50% Migration Timing: Area 20	50% Migration Timing: Mission	Weekly JS Diversion Rate
August 2	In-season	Early Stuart	200,000	158,000	41,000	1,000	0	0	0	15-Jul	21-Jul	
		Early Summer	391,000	217,000	103,000	5,000	22,900	43,100	70,000	31-Jul	6-Aug	
		Summer	11,048,000	5,262,000	766,000	88,000	369,800	4,562,200	5,020,000	23-Aug	30-Aug	
		Birkenhead	277,000	132,000		1,000	3,700	140,300	145,000	25-Aug	1-Sep	
		Late	247,000	210,000		1,000	3,600	32,400	37,000	23-Aug	26-Aug	
		Sockeye	12,163,000	5,979,000	910,000	96,000	400,000	4,778,000	5,272,000			50%
		Pink	16,318,000	6,000,000		10,000		10,308,000	10,318,000			
August 5	In-season	Early Stuart	205,000	161,000	43,000	1,000	0	0	0	15-Jul	21-Jul	
		Early Summer	250,000	146,000	61,000	3,000	22,900	17,100	43,000	31-Jul	6-Aug	
		Summer	11,048,000	5,262,000	768,000	88,000	369,800	4,560,200	5,018,000	16-Aug	22-Aug	
		Birkenhead	277,000	132,000		1,000	3,700	140,300	145,000	25-Aug	1-Sep	
		Late	247,000	210,000		1,000	3,600	32,400	37,000	23-Aug	26-Aug	
		Sockeye	12,027,000	5,911,000	872,000	94,000	400,000	4,750,000	5,243,000			50%
		Pink	16,318,000	6,000,000		10,000		10,308,000	10,318,000			
August 9	In-season	Early Stuart	209,000	165,000	42,000	2,000	0	0	0	15-Jul	21-Jul	
		Early Summer	250,000	146,000	61,000	8,000	22,900	12,100	43,000	31-Jul	6-Aug	
		Summer	11,048,000	5,262,000	768,000	88,000	369,800	4,560,200	5,018,000	16-Aug	22-Aug	
		Birkenhead	277,000	132,000		1,000	3,700	140,300	145,000	25-Aug	1-Sep	
		Late	247,000	210,000		1,000	3,600	32,400	37,000	23-Aug	26-Aug	
		Sockeye	12,031,000	5,915,000	871,000	100,000	400,000	4,745,000	5,243,000			60%
		Pink	16,318,000	6,000,000		10,000		10,308,000	10,318,000			
August 16	In-season	Early Stuart	209,000	164,000	43,000	2,000	0	0	0	15-Jul	21-Jul	
		Early Summer	250,000	146,000	68,000	8,000	22,900	5,100	36,000	31-Jul	6-Aug	
		Summer	3,000,000	2,199,000	330,000	75,000	369,800	26,200	471,000	16-Aug	22-Aug	
		Birkenhead	277,000	203,000		1,000	3,700	69,300	74,000	25-Aug	1-Sep	
		Late	247,000	210,000		6,000	3,600	27,400	37,000	23-Aug	26-Aug	
		Sockeye	3,983,000	2,922,000	441,000	92,000	400,000	128,000	618,000			65%
		Pink	16,318,000	6,000,000		10,000		10,308,000	10,318,000			
August 19	In-season	Early Stuart	209,000	164,000	43,000	2,000	0	0	0	15-Jul	21-Jul	
		Early Summer	300,000	172,000	80,000	8,000	22,900	17,100	48,000	31-Jul	6-Aug	
		Summer	3,000,000	2,199,000	330,000	75,000	369,800	26,200	471,000	16-Aug	22-Aug	
		Birkenhead	277,000	203,000		1,000	3,700	69,300	74,000	25-Aug	1-Sep	
		Late	247,000	210,000		6,000	3,600	27,400	37,000	23-Aug	26-Aug	
		Sockeye	4,033,000	2,948,000	453,000	92,000	400,000	140,000	630,000			65%
		Pink	16,318,000	6,000,000		10,000		10,308,000	10,318,000			
August 22	In-season	Early Stuart	209,000	164,000	43,000	2,000	0	0	0	15-Jul	21-Jul	
		Early Summer	375,000	209,000	153,000	13,000	22,900	0	0	31-Jul	6-Aug	
		Summer	4,500,000	2,972,000	446,000	75,000	369,800	637,200	1,082,000	16-Aug	22-Aug	
		Birkenhead	277,000	183,000		1,000	3,700	89,300	94,000	25-Aug	1-Sep	
		Late	247,000	210,000		7,000	3,600	26,400	37,000	23-Aug	26-Aug	
		Sockeye	5,608,000	3,738,000	642,000	98,000	400,000	752,900	1,213,000			80%
		Pink	16,318,000	6,000,000		10,000		10,308,000	10,318,000			
August 24	In-season	Early Stuart	209,000	164,000	44,000	1,000	0	0	0	15-Jul	21-Jul	
		Early Summer	400,000	221,000	163,000	16,000	22,900	0	0	31-Jul	6-Aug	
		Summer	5,000,000	3,201,000	320,000	85,000	369,800	1,024,200	1,479,000	16-Aug	22-Aug	
		Birkenhead	277,000	177,000		3,500	3,700	92,800	100,000	25-Aug	1-Sep	
		Late	316,000	269,000		8,500	3,600	34,900	47,000	23-Aug	26-Aug	
		Sockeye	6,202,000	4,032,000	527,000	114,000	400,000	1,151,900	1,626,000			80%
		Pink	16,318,000	6,000,000		10,000		10,308,000	10,318,000			

Table 2, continued.

Date	Management Group	Total Abundance	TAC: Spawning Escapement Target	TAC: Manage-ment Adjust.	TAC: Test Fishing	TAC: Aboriginal Fishery Exemption	TAC: Total Allowable Catch	Available Harvest (Incld. TF + AFE)	50% Migration Timing: Area 20	50% Migration Timing: Mission	Weekly JS Diversion Rate
August 26 In-season	Early Stuart	209,000	164,000	44,000	1,000	0	0	0	15-Jul	21-Jul	
	Early Summer	450,000	245,000	189,000	16,000	22,900	0	2,000	10-Aug	16-Aug	
	Summer	6,000,000	3,623,000	73,000	92,000	369,800	1,842,200	2,305,000	22-Aug	28-Aug	
	Birkenhead	277,000	167,000		3,500	3,700	102,800	110,000	25-Aug	1-Sep	
	Late	261,000	222,000		8,500	3,600	26,900	39,000	23-Aug	26-Aug	
	Sockeye	7,197,000	4,421,000	306,000	121,000	400,000	1,971,900	2,456,000			80%
	Pink	16,318,000	6,000,000		10,000		10,308,000	10,318,000			
August 29 In-season	Early Stuart	210,000	164,000	44,000	2,000	0	0	0	15-Jul	21-Jul	
	Early Summer	500,000	268,000	216,000	16,000	22,900	0	10,000	10-Aug	16-Aug	
	Summer	6,000,000	3,623,000	73,000	95,000	369,800	1,839,200	2,305,000	22-Aug	28-Aug	
	Birkenhead	277,000	167,000		3,500	3,700	102,800	110,000	25-Aug	1-Sep	
	Late	331,000	282,000		7,500	3,600	37,900	49,000	23-Aug	26-Aug	
	Sockeye	7,318,000	4,504,000	333,000	124,000	400,000	1,979,900	2,474,000			90%
	Pink	16,318,000	6,000,000		10,000		10,308,000	10,318,000			72%
September 2 In-season	Early Stuart	210,000	164,000	44,000	2,000	0	0	0	15-Jul	21-Jul	
	Early Summer	650,000	334,000	277,000	16,000	22,900	0	40,000	17-Aug	23-Aug	
	Summer	6,500,000	3,819,000	76,000	95,000	369,800	2,140,200	2,605,000	24-Aug	30-Aug	
	Birkenhead	277,000	163,000		3,500	3,700	106,800	114,000	25-Aug	1-Sep	
	Late	416,000	353,000		7,500	3,600	51,900	63,000	23-Aug	26-Aug	
	Sockeye	8,053,000	4,833,000	397,000	124,000	400,000	2,298,900	2,822,000			90%
	Pink	16,318,000	6,000,000		10,000		10,308,000	10,318,000			72%
September 6 In-season	Early Stuart	210,000	164,000	44,000	2,000	0	0	0	15-Jul	21-Jul	
	Early Summer	750,000	375,000	310,000	16,000	22,900	26,100	65,000	20-Aug	26-Aug	
	Summer	7,000,000	4,006,000	80,000	95,000	369,800	2,449,200	2,914,000	24-Aug	30-Aug	
	Birkenhead	277,000	159,000		3,500	3,700	110,800	118,000	25-Aug	1-Sep	
	Late	510,000	433,000		7,500	3,600	65,900	77,000	23-Aug	26-Aug	
	Sockeye	8,747,000	5,137,000	434,000	124,000	400,000	2,652,000	3,174,000			95%
	Pink	16,318,000	6,000,000		10,000		10,308,000	10,318,000			70%
September 9 In-season	Early Stuart	210,000	164,000	44,000	2,000	0	0	0	15-Jul	21-Jul	
	Early Summer	750,000	375,000	310,000	16,000	22,900	26,100	65,000	20-Aug	26-Aug	
	Summer	7,000,000	4,006,000	80,000	95,000	369,800	2,449,200	2,914,000	24-Aug	30-Aug	
	Birkenhead	277,000	159,000		3,500	3,700	110,800	118,000	25-Aug	1-Sep	
	Late	560,000	476,000		7,500	3,600	72,900	84,000	23-Aug	26-Aug	
	Sockeye	8,797,000	5,180,000	434,000	124,000	400,000	2,659,000	3,181,000			95%
	Pink	16,318,000	6,000,000		10,000		10,308,000	10,318,000			70%
September 14 In-season	Early Stuart	210,000	164,000	44,000	2,000	0	0	0	15-Jul	21-Jul	
	Early Summer	775,000	385,000	318,000	16,000	22,900	33,100	72,000	20-Aug	26-Aug	
	Summer	7,000,000	4,006,000	80,000	95,000	369,800	2,449,200	2,914,000	24-Aug	30-Aug	
	Birkenhead	277,000	159,000		3,500	3,700	110,800	118,000	25-Aug	1-Sep	
	Late	560,000	476,000		7,500	3,600	72,900	84,000	23-Aug	26-Aug	
	Sockeye	8,822,000	5,190,000	442,000	124,000	400,000	2,666,000	3,188,000			92%
	Pink	10,000,000	6,000,000		10,000		3,990,000	4,000,000			90%
September 16 In-season	Early Stuart	210,000	164,000	44,000	2,000	0	0	0	16-Jul	22-Jul	
	Early Summer	800,000	395,000	327,000	16,000	22,900	39,100	78,000	20-Aug	26-Aug	
	Summer	7,000,000	4,006,000	80,000	95,000	369,800	2,449,200	2,914,000	23-Aug	29-Aug	
	Birkenhead	200,000	115,000		3,500	3,700	77,800	85,000	25-Aug	31-Aug	
	Late	560,000	476,000		7,500	3,600	72,900	84,000	23-Aug	31-Aug	
	Sockeye	8,770,000	5,156,000	451,000	124,000	400,000	2,639,000	3,161,000			92%
	Pink	10,000,000	6,000,000		10,000		3,990,000	4,000,000			90%
October 8 TAC Date	Early Stuart	210,000	164,000	44,000	2,000	0	0	0	16-Jul	22-Jul	
	Early Summer	775,000	385,000	318,000	14,000	22,900	35,100	72,000	20-Aug	26-Aug	
	Summer	7,000,000	4,006,000	80,000	93,000	369,800	2,451,200	2,914,000	23-Aug	29-Aug	
	Birkenhead	277,000	159,000		2,000	3,700	112,300	118,000	25-Aug	31-Aug	
	Late	560,000	476,000		7,000	3,600	73,400	84,000	23-Aug	31-Aug	
	Sockeye	**8,822,000**	**5,190,000**	**442,000**	**118,000**	**400,000**	**2,672,000**	**3,188,000**			
	Pink	**10,000,000**	**6,000,000**		**10,000**		**3,990,000**	**4,000,000**			

During the week of August 14-20, Staff reported that the sockeye migration via both approach routes had increased, accompanied by a higher Johnstone Strait diversion rate of 65%. Recent marine area DNA samples showed higher than expected fractions of Early Summer-run sockeye, indicating an abnormally broad migration profile. Pink salmon catches were increasing in marine test fisheries, which was consistent with a normal build-up of pink salmon at this date. Mission escapements had increased above previously projected numbers. However, concerns persisted over the higher than expected fractions of pink salmon at Mission. The pink migration at Hells Gate was large for the date, confirming the early entry of pink salmon into the river. Based on the accounted Early Summer run to date and continued presence of these fish in marine samples, the Panel approved an increased Early Summer run size of 300,000 fish. Estimates of Summer-run abundance remained highly uncertain, with DNA samples indicating contradictory signals of stock strengths. The last Area 20 sample contained a relatively high fraction of Mitchell sockeye, which was a negative signal for the overall Quesnel return because Mitchell sockeye are generally a late component of the Quesnel run. However, a sample from Area 12 contained 16% Early Summer-run fish, indicating even later timing than currently estimated. A sample from the District 104 fishery in Alaska from August 14 - 17 contained 7% Early Summer-run and 93% Summer-run sockeye, which indicated a very protracted migration for both runs. Due to the high degree of uncertainty in Summer-run abundance estimates (ranging from 1,900,000 to 6,600,000 fish), the Panel agreed to an operational run size of 3,000,000 Summer-run fish for planning purposes, without formally adopting a run-size change. The Treaty Indian drift gillnet fishery in Areas 4B, 5, and 6C was closed due to poor test fishery catches, but later in the week was re-opened when test fishery catches improved.

The week of August 21-27 was a difficult assessment period. Marine test fishing catches were variable, while DNA samples continued to show a broad array of stocks in the assessment areas, including Early Summer-run fish. Samples from District 104 in Alaska were comprised of a high fraction (> 80%) of Fraser River sockeye. These results provided further evidence of protracted and very late migrations of Early Summer and Summer-run sockeye. Based on Staff recommendations, the Panel approved run-size upgrades for Early Summer (375,000 fish) and Summer runs (4,500,000 fish) early in the week. The revised Early Summer update resulted in an Area 20 50% date of August 6 (the latest on record) and a correspondingly higher MA factor because of the exposure of these stocks to warmer Fraser River water temperatures. This change eliminated all TAC for Early Summer-run sockeye. Later in the week, Mission escapement estimates were stronger than expected, and there were indications that the sockeye migration was building again in Johnstone Strait (80% diversion rate). Fraser River pink salmon abundance was also increasing, particularly in Johnstone Strait, and the pink salmon escapement past Mission had reached 206,000 fish. Despite the rapid build-up in the pink migration, Staff reported it was too early to evaluate the strength of the return. However, the substantial upstream migration of pink salmon was continuing to raise concerns about potential bias in the species composition estimates from in-river test fisheries and corresponding overestimation of Mission sockeye escapement. Estimates of sockeye escapement were 317,000 Early Summer, 1,575,000 Summer, 6,600 Birkenhead, 12,000 Weaver / Late Shuswap, 117,000 Harrison 4_1 sockeye, and an additional 45,000 age 3_1 sockeye of mixed-stock origin. Based on the increased abundance levels and protracted run timing of Fraser sockeye stocks, the Panel approved the following run-size changes by the end of the week: Early Summer – 450,000 fish; Summer – 6,000,000 fish; Harrison – 180,000 fish (age 4_1); and Weaver / Late Shuswap – 81,000 fish (the 75% probability level forecast). The Panel also approved a revised MA factor for Summer-run sockeye (0.02). Canada noted that the reduced Late-run return lowered Canada's available Late-run impacts to 6,000 fish, thereby eliminating Canadian commercial fishery opportunities even though there were significant numbers of Summer-run fish available for harvest. The U.S., however, had approximately 3,500 Late-run TAC remaining. The Panel approved a continuation of U.S. fisheries in Areas 4B, 5 and 6C for Treaty Indian fishers, and opened Areas 7 and 7A for both Treaty Indian and Non-Indian fishers.

By the week of August 28-September 3, test fishing catches in both marine approach areas had declined. The estimated Johnstone Strait diversion rate for sockeye exceeded 90%, with significant sockeye migration continuing through the northern approach route. Meanwhile, the sockeye escapement past Mission remained strong, with a passage of almost one million sockeye over three days. In addition, large numbers of pink salmon migrating along the north shore of the

Fraser River near Mission continued to present serious problems for estimating species composition using the in-river test fisheries. DNA results showed fluctuating proportions of Late-run sockeye in both marine and in-river samples, which made it difficult to project Late-run catch impacts and to plan fisheries. Marine test fishing samples indicated that the Fraser River pink migration was occurring predominantly through Johnstone Strait (70% diversion rate). For the date, both the gross escapement of pink salmon (724,000 fish) and count at Hells Gate were higher than any previous year. However, the pink migration was tracking below the 75% probability level forecast (11,698,000 fish), with approximately 7,200,000 Fraser pink salmon accounted through marine assessment sites to date. Staff projected the pink run would likely reach 8,000,000 to 9,000,000 fish, significantly above the escapement target of 6,000,000 fish. Run-size estimates for Weaver Creek/Late Shuswap stocks ranged between 179,000 and 228,000 (with August 28 and September 3 timing).The Panel approved the following run-size increases for Fraser River sockeye: Early Summer – 650,000 fish; Summer – 6,500,000 fish; Harrison age 4_1 fish – 260,000 fish; and Weaver / Late Shuswap – 156,000 fish. Canada noted that with the increased Late-run estimates, there were 4,200 Late-run harvest impacts available to Canadian commercial fishers. However, there were concerns about exceeding the exploitation rate limit on Cultus Lake sockeye, catch obligations to First Nations and a need to reserve some Late-run harvest impacts for possible pink salmon directed fisheries. Consequently, no commercial harvest opportunities were available in Canada. The Panel approved additional U.S. fisheries in Areas 4B, 5 and 6C for Treaty Indian fishers, and in Areas 7 and 7A for both Treaty Indian and Non-Indian fishers.

For the week of September 4-10, Staff noted that abundances of both sockeye and pink salmon were declining in both approaches, with pink salmon predominating and with Johnstone Strait diversion rates of 95% for sockeye and 70% for Fraser pinks. The accounted passage of pink salmon through marine approach areas totalled 8,900,000 fish. Sockeye escapement past Mission continued to exceed expectations, with possible reasons being: (1) purse seine test fishing expansion lines were too low; (2) Summer-run sockeye had been delaying; and (3) pink salmon were being underestimated and sockeye overestimated in species composition estimates being applied to total salmon passage at Mission. Based on accounted fish in catch and escapement, and projections of in-coming fish, the Panel approved the following run-size recommendations: Early Summer – 750,000 fish with an Area 20 timing date of August 20 (above the 50% probability level forecast of 718,000); Summer – 7,000,000 fish; Harrison (unchanged) – 260,000 fish; and Weaver / Late Shuswap – 300,000 fish (for a total Late run of 560,000 fish - above the 50% probability level forecast of 524,000 fish). With the increased Late-run run size, there were 39,000 Late-run sockeye available for harvest, including 3,600 fish in the U.S. and 36,000 fish in Canadian waters (for First Nations, recreational and commercial fishers). The Panel approved U.S. fisheries in Areas 4B, 5 and 6C for Treaty Indian fishers, and in Areas 7 and 7A for both Treaty Indian and Non-Indian fishers. Canada announced non-Panel Area commercial fisheries directed primarily at Fraser River pink salmon harvest in Areas D (gillnet), G (troll, with non-retention of sockeye) and B (purse seine).

During the last week of Panel management (September 11-17), relatively strong sockeye escapements past Mission initially continued, but the sockeye migration though Johnstone Strait was declining rapidly. DNA analysis of a sockeye sample collected from the Area 12 purse seine test fishery on September 13 still contained a substantial proportion of Early Summer sockeye (7%) along with estimates of 78% Summer, 2% Birkenhead and 13% Late-run sockeye. Test fishing catches of Fraser River pink salmon in both approaches were also declining, although the run was expected to continue migrating into the river over the next couple of weeks. The reconstructed abundance of Fraser River pink salmon was 9,400,000 fish through marine approach areas to date, with a diversion rate of 71%. The Panel approved a run-size estimate of 10,000,000 Fraser River pink salmon, and an Area H troll fishery in Area 18. The Panel also approved the relinquishment of regulatory control in Areas 4B, 5 and 6C effective September 13 and of Areas 6, 6A, 7 and 7A (excluding the Apex north and west of the Early Point Light Line) effective September 17.

Regulatory control of the last U.S. Panel Area (remaining portions of Area 7A) was relinquished on October 8 (Table 2), in accordance with the pre-season Regulations (Appendix G). According to the revised Annex IV, Chapter 4 of the Pacific Salmon Treaty (Appendix A) and the Commission Guidance to the Panel (Appendix B), the calculation of the TAC and international shares (Table 20) was frozen on this date.

Fishing times in Canadian and U.S. Panel Areas are summarized in Tables 3 and 4, respectively. In Canada, due to the low returns, late timing, and overlap between Late-run stocks and co-migrating Summer-run sockeye and Fraser pink salmon, the only Panel Area fishery was an Area 18 troll fishery in mid-September to catch pink salmon. Other Canadian commercial fisheries were concentrated in a one-week period in Johnstone Strait. No gillnet fishing was scheduled in Area 20 due to coho conservation concerns. In the U.S., the high diversion rate through Johnstone Strait resulted in low abundances in Juan de Fuca Strait and Puget Sound, and so Panel Area fisheries in Washington were open for extended periods to provide adequate opportunity to harvest the U.S. share.

Table 3. Number of days when fishing occurred in Canadian commercial fisheries in the Fraser River Panel Area in 2005. Regulatory control of Canadian Panel Areas was relinquished by the Panel on September 17 for Area 20, October 1 for Areas 17 and 18, and October 15 for Area 29.

	Area 20		Area 29	Areas 18,29
Date	Purse Seine	Gillnet	Gillnet	Troll
Jun.19-Jul.30				
Jul.31-Aug.6				
Aug.7-Aug.13				
Aug.14-Aug.20				
Aug.21-Aug.27				
Aug.28-Sep.3				
Sep.4-Sep.10				
Sep.11-Sep.17				4 *
Sep.18-Oct.15				
Total	0	0	0	4

* Area 18 only.

Table 4. Number of days when fishing occurred in major U.S. net fisheries in the Fraser River Panel Area in 2005. Regulatory control of U.S. Panel Areas was relinquished by the Panel on September 13 for Areas 4b, 5 and 6c, September 17 for Areas 6, 7 and 7a (except for a portion of Area 7a near Point Roberts), and October 8 for the remaining portions of Area 7a.

	Treaty Indian		Non-Indian		
	Areas	Areas	Areas 7 and 7A		
Date	4B, 5, 6C	6, 7, 7A	Purse Seine	Gillnet	Reefnet
Jun.19-Jul.30					
Jul.31-Aug.6	6				
Aug.7-Aug.13	7				
Aug.14-Aug.20 *	5				
Aug.21-Aug.27 *	7	2		1	1
Aug.28-Sep.3 *	4	2	1	1	1
Sep.4-Sep.10 *	5	3	3	3	2
Sep.11-Sep.17	2	2	2	2	2
Sep.18-Oct.15					
Total	36	9	6	7	6

* Non-retention of sockeye during pink salmon-directed fisheries.

IV. MANAGEMENT INFORMATION

To facilitate decision making, the Panel requires information about the abundance, timing, migration route and catch levels of Fraser sockeye (by stock group) and pink salmon. In the pre-season period these quantities are usually provided by DFO in the form of forecasts. However, Staff operate various programs to provide such data during the in-season period (Appendix I). First, stock monitoring programs collect information on abundance at various points along the migration route using test fisheries, hydroacoustic facilities (Mission) and observers (Hells Gate). The locations and schedule for these Staff and DFO programs are listed in Table 5. These data are augmented with information from commercial and First Nations fisheries. Second, stock identification programs collect and analyze biological samples (e.g., DNA, scales) from various fisheries that allow the total abundance of sockeye and pink salmon to be apportioned into component stock groups. Table 6 shows the stock resolution for Fraser sockeye that was reported in 2005. Finally, the stock monitoring and stock identification data are combined to provide stock or stock-group estimates of catch, escapement, daily abundance, migration timing and diversion rate which are the basis for estimating run sizes, escapement targets and catch allocations for the different management groups. These data are compiled and analysed by Staff and the results provided to the Panel.

Staff also provide estimates of how many additional fish should be allowed to escape fisheries to increase the likelihood of successfully achieving the spawning escapement targets, given migration conditions and timing in the river. These "Management Adjustments" (MAs) are based on statistical models that consider the historical differences between in-season projections of spawning escapement (i.e., "potential spawning escapement", calculated as Mission escapement minus catch above Mission), and post-season estimates from spawning ground enumeration programs. For Early Stuart, Early Summer and Summer-run stocks, the models relate historical differences between estimates (DBEs) to the severity of river conditions measured near Hells Gate. When discharge levels or temperatures are high, then differences between estimates also tend to be high. In addition, for Early Stuart and Early Summer runs, in-season estimates are consistently higher than spawning ground estimates even when migration conditions are within normal ranges, and this tendency is also captured by the MA models. For Late-run sockeye, historical differences between estimates are related to the date when half the run has migrated past Mission (i.e., 50% date), which captures the effect of the early migration observed in recent years on the migration success of these stocks.

Assessment estimates used for Panel management can be divided into three general categories: a) pre-season forecasts and expectations, on which pre-season planning activities and the management plan are based, b) in-season estimates that develop over the course of the season and culminate in a set of final in-season estimates and c) post-season estimates derived from information that was unavailable during the season, such as spawning ground estimates of escapement, more complete catch estimates, better standards for stock identification, and adjustments for estimates that in hindsight appear to have been biased or incorrect. Key estimates in these categories are summarized in Table 2 and discussed below.

Table 5. Panel-approved stock monitoring operations (test fishery, hydroacoustic, observer) for the 2005 fishing season.

Area	Location	Gear	Dates	Operated by
Canadian Panel Areas				
20	Juan de Fuca Str.	Purse Seine	July 25 - September 12	PSC
20	Juan de Fuca Str.	Gillnet	June 21 - August 24	PSC
29-1 to 6	Str. of Georgia	Troll	August 30 - September 8	PSC
29-13	Fraser R. (Cottonwood)	Gillnet	July 13 - September 23	PSC
29-16	Fraser R. (Whonnock)	Gillnet	June 22 - September 28	PSC
29-16	Fraser R. (Mission)	Hydroacoustic	June 26 - September 25	PSC
	Fraser R. (Hells Gate)	Observer	July 2 - October 4	PSC
Canadian non-Panel Areas				
12	Johnstone Str.	Gillnet	July 10 - August 16	DFO
12	Johnstone Str.	Purse Seine	July 20 - September 13	DFO
13	Johnstone Str.	Purse Seine	July 20 - September 10	DFO
United States Panel Areas				
5	Juan de Fuca Str.	Gillnet	July 27 - July 31	PSC
7	San Juan Islands	Reefnet	July 11 - August 30	PSC

Table 6. Individual stocks comprising the Fraser River sockeye stock groups used in 2005.

Stock Group	Component Stocks
Early Stuart	
Early Stuart	Early Stuart stocks
Early Summer	
Chilliwack	Chilliwack Lake, Dolly Varden Creek
Early Miscellaneous	Fennell, Bowron, Raft, Nahatlatch, Nadina, Gates
Seymour/Scotch	Scotch, Seymour, early Eagle, Cayenne, Upper Adams
Pitt	Pitt
Summer	
Chilko	Chilko, south end Chilko Lake
Horsefly/McKinley	Horsefly, McKinley
Mitchell/Lake Tributaries	Mitchell, Roaring, Wasko, Blue Lead
Late Stuart/Stellako	Stellako, Tachie, Middle, Pinchi, Kuzkwa
Birkenhead	
Birkenhead	Birkenhead, Big Silver
Late	
Late Shuswap/Portage	Lower Adams, Portage, Lower Shuswap, Middle Shuswap, Little Shuswap, Shuswap Lake, late Eagle
Weaver/Cultus	Weaver, Cultus
Harrison	Harrison, Widgeon

A. Run Size

Methods for calculating sockeye salmon abundance differ between the in-season and post-season periods. In-season estimates are generated by run-size and run reconstruction models that incorporate catch, test fishery CPUE (catch per unit effort) and Mission escapement data by stock group. These estimates are provided to the Panel by Staff. Such estimates that are adopted by the Panel become the official in-season run-size estimates used for management decisions, as displayed in Table 2. Ideally, these estimates would approximately equal the sum of all catches and escapements past Mission, however, these only become available at the end of the season. Post-season estimates are based on the sum of catches wherever taken and on spawning ground enumerations. In situations where en route mortalities in the Fraser River are deemed to have occurred for a given stock group, additional sockeye are added to the total. These additional fish are often estimated by calculating the difference between estimates of potential spawning escapement (i.e., Mission escapement minus catch above Mission) and spawning ground enumerations. In 2005, an additional adjustment was required because a bias was discovered in the in-season Mission estimates that resulted in in-season estimates of potential spawning escapement and run size that were too high. The post-season analysis that was conducted to correct for this bias is described in Appendix J. This analysis resulted in post-season estimates of sockeye run size that were smaller than in-season estimates.

The methodology for estimating pink salmon abundance is much different. The escapement of pink salmon past Mission cannot be assessed by existing programs and neither are spawning enumeration programs conducted for Fraser pinks. The consequence is that the only run-size estimates available for pink salmon are in-season estimates based on run-size and run-reconstruction models that incorporate catch and CPUE data. Thus, post-season estimates of pink salmon run size are simply the final in-season estimates.

Final in-season estimates of run size totalled 8,770,000 Fraser sockeye and 10,000,000 Fraser pink salmon (bottom of Table 2). The sockeye estimate was slightly higher than the 75% probability level forecast of 8,700,000 (Appendix C), while the post-season estimate (7,077,000 fish, Tables 8 and 9) was even lower, between the 80-90% probability level forecasts. The result for Fraser pink salmon was similar, with the run-size estimate (10,000,000 fish) between the 80-90% probability level forecasts. For Fraser sockeye, deviations from the forecasts were not evenly shared among the management groups. In particular, Summer-run abundance was much lower than forecast while Late-run abundance was much higher.

B. Migration Timing

Migration timing in 2005 was much later than historical averages (which were adopted as the pre-season forecasts) for all sockeye management groups (Figure 3, Table 2) and the latest on record since at least 1976 for Early Stuart, Early Summer and Summer runs. The most dramatic observation was a post-season Area 20 date of August 21 for Early Summers, which was 29 days later than forecast and 14 days later than the previous latest date in the 1976-2004 period. Similarly, Early Stuart timing in Area 20 was 13 days later than forecast and 6 days later than the previous record, and Summer-run timing was 15 days later than forecast and 7 days later than the previous record. The smallest deviation from historical marine migration dates was for the Late run, with an Area 20 date 9 days later than forecast. The 50% dates through Area 20 for the Harrison and Weaver/Late Shuswap components of the Late run were August 15 and August 29, respectively. In contrast to sockeye, pink salmon returned with a 50% Area 20 date six days earlier than expected. The late sockeye migration in combination with the early pink migration lead to an almost complete overlap in the migrations of these species (Figure 4), which caused assessment difficulties that contributed to the Mission bias described previously.

Similar patterns were observed for Mission timing dates, with one exception. For Late-run sockeye, the Mission date was only four days later than expected (post-season Mission date of August 26 versus expected date of August 22). The reason for this was an unexpectedly large migration of Harrison sockeye, which is a Late-run component that migrates earlier than other Late-run stocks. In 2005, the 50% Mission date was August 23 for Harrison sockeye and September 7 for the other Lates. Based on this relatively late migration for the non-Harrison Lates, there was optimism that en route losses due to the early migration phenomenon observed in recent

years would be less severe in 2005. This optimism appears to be born out by the relatively small Late-run DBEs estimated for 2005.

C. Diversion Rate

In-season and post-season estimates of diversion rate were similar to pre-season expectations for both sockeye (78%) and pink salmon (60%). The in-season estimate for Fraser sockeye increased from about 40% in the third week of July to 80% by the end of August and 90-95% during September. Weekly diversion rates for Fraser pink salmon were about 70% for most of the season except at the end of the migration in mid-September when it briefly increased to 90%. The annual Johnstone Strait diversion rates were 74% for sockeye and 70% for pink salmon.

D. Management Adjustments and DBEs

While pre-season MAs and DBEs are based on median values from the historical dataset or on long-range forecasts of river conditions, in-season estimates are derived from statistical models using pre-season or in-season migration timing estimates, and observed and short-range forecasts of river discharge and temperature levels. Post-season values are directly calculated from the difference between post-season estimates of potential spawning escapement (i.e., Mission escapement minus catch above Mission) and spawning ground enumerations.

Post-season estimates of %DBEs were larger in magnitude than both the pre-season forecasts and in-season estimates for Early Stuart, Early Summer and Summer-run sockeye. For Early Stuart, the pre-season forecast and in-season estimate were both -42%, compared to a post-season observed estimate of -50%. Similarly, the pre-season, in-season and post-season estimates for Early Summers were -32%, -45% and -61%, respectively, and for the Summer-run group were -13%, -2% and -37%. Although river temperatures were slightly warmer than average (Figure 5), the later migration timing of the Early Summer and Summer runs placed them in the river during the period of declining temperatures, with the result that they were not exposed to warmer conditions than they would normally experience. Discharge levels (Figure 5), while low, were not extreme and in fact may have eased the difficulty of upstream migration for some stocks. Thus, the high DBE levels observed for these stocks are not explained by the relatively benign river conditions in 2005, leaving the possibility that en route migration success was negatively affected by the very late migration timing.

In contrast, the post-season DBE estimate (-29%) for Late-run stocks was much smaller than predicted (-78%) from the early in-river migration date (August 26) and associated observations of high en route losses in recent years. These smaller than expected DBEs may be related to the large Harrison component and the positive DBEs observed for this stock group (i.e., more fish were estimated on the Harrison spawning grounds than were expected based on Mission escapement minus catch upstream).

MAs and DBEs are not calculated for pink salmon, since neither of the estimates required for the calculation are available: their abundance past Mission cannot be directly assessed and spawning ground enumerations are not conducted.

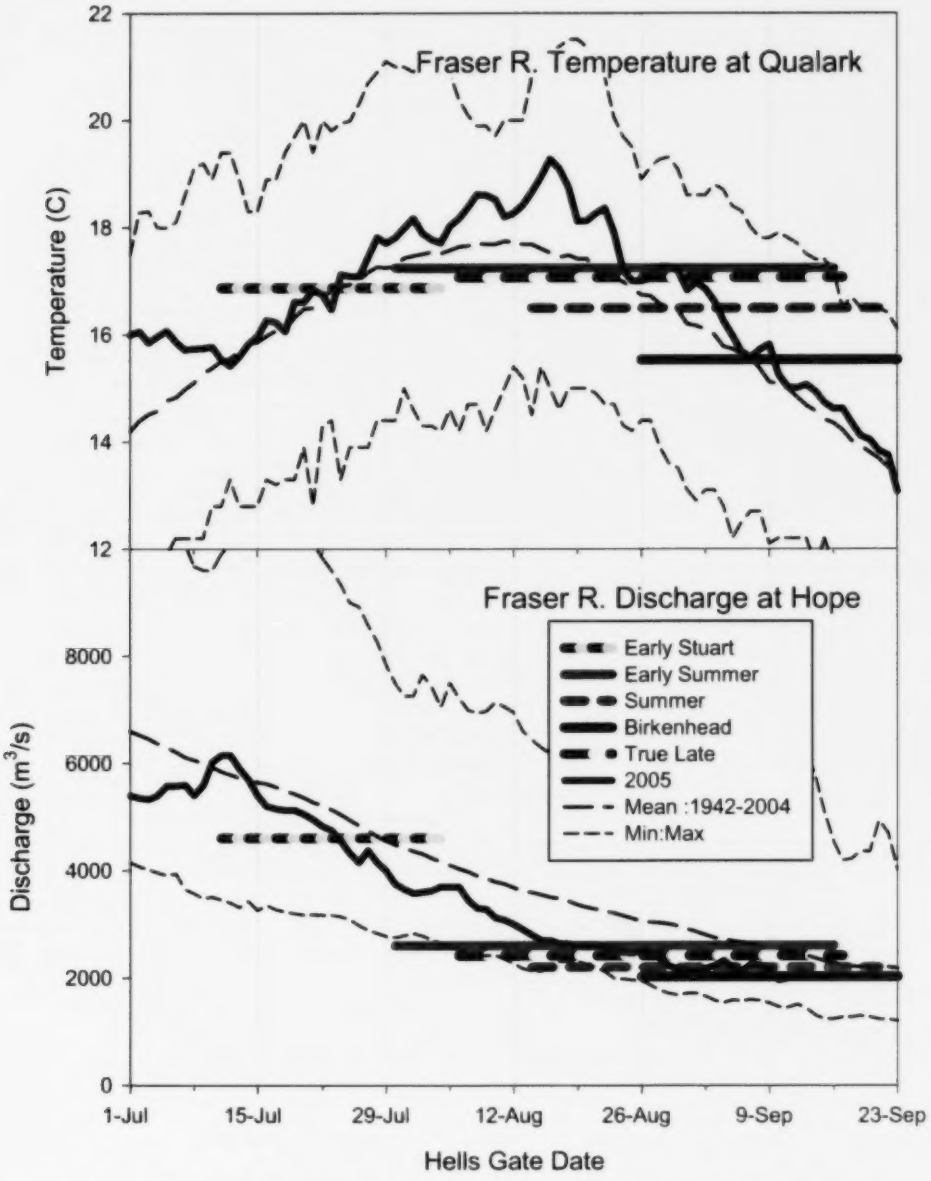


Figure 5. Fraser River temperatures and discharges measured near Hope in 2005, with weighted (by daily Mission abundance) mean temperatures and discharges during the central 90% of the migration of each management group (excluding Pitt).

E. Mission Escapement

Spawning ground enumerations of sockeye spawners totalled considerably less than in-season expectations that were based primarily on Mission hydroacoustic estimates of passage. The post-season analysis that was undertaken to investigate the discrepancy (Appendix J) provided post-season Mission escapement estimates that were adjusted to account for revised species composition estimates and for the addition of age 3_1 sockeye that were not included in in-season assessments.

The adjusted Mission escapements of most sockeye stock groups were 26% to 38% lower than in-season estimates (Table 7). The largest percentage difference between in-season and post-season estimates occurred for Pitt River sockeye (-48%) (Note: Pitt River sockeye spawn downstream of Mission and so are not directly assessed by the Mission hydroacoustic program. Instead, a nominal escapement number is calculated from their contribution to Early Summer stock proportions below Mission in combination with Mission abundance estimates). Post-season estimates were greater than in-season estimates for only Early Stuart and Chilliwack sockeye, which return earlier than most other Fraser sockeye groups.

Table 7. Comparison of in-season estimates of Fraser River sockeye escapement past Mission in 2005 and post-season revised estimates as described in Appendix J.

Stock Group	Mission Escapement		Difference	
	In-season *1*	Post-season *2*	Fish	%
Early Stuart	206,000	215,000	9,000	4%
Early Summer				
Chilliwack	4,000	5,000	1,000	25%
Early Miscellaneous	580,000	428,000	-152,000	-26%
Seymour/Scotch	55,000	39,000	-16,000	-29%
Pitt	119,000	62,000	-57,000	-48%
Total	757,000	534,000	-224,000	-30%
Summer				
Chilko	1,330,000	851,000	-479,000	-36%
Quesnel	4,362,000	2,957,000	-1,405,000	-32%
Late Stuart/Stellako	830,000	566,000	-264,000	-32%
Total	6,522,000	4,373,000	-2,148,000	-33%
Birkenhead	177,000	144,000	-33,000	-19%
Late				
Late Shuswap/Portage *3*	89,000	59,000	n/a	n/a
Weaver/Cultus	199,000	141,000	-58,000	-29%
Harrison (4_1's only) *3*	233,000	220,000	n/a	n/a
All stocks (3_1's only) *4*	160,000	n/a	n/a	n/a
Total	681,000	420,000	-261,000	-38%
Total	8,343,000	5,686,000	-2,624,000	-31%

1 Mission escapement derived from daily split-beam hydroacoustic estimates.

2 Mission escapement derived from daily split-beam hydroacoustic estimates adjusted for species composition bias.

3 Harrison, Widgeon in-season estimates were 4_1's only, while post-season estimates included both 3_1's and 4_1's.

4 In-season 3_1's kept separate based on scale age. Post-season 3_1's assigned to stock group of orgin using DNA.

V. SALMON RUN, CATCH AND ESCAPEMENT SUMMARY

Table 8 provides an overview of run size by management group for Fraser sockeye and total run for Fraser pink salmon. Included are estimates of spawning escapements, DBEs, catches in major fisheries and gross escapements. Table 9 provides similar information, but with more detail on individual stock groups. Figures 6 (sockeye), 7 (sockeye) and 9 (pink) show catch, escapement, exploitation rate and run size by year for a historical perspective. Details of commercial catch distributions by area and gear in Canada and the U.S. are provided in Tables 10-11 (sockeye) and Tables 13-14 (pinks). Tables 1-12 in Appendix K show weekly commercial catches in Canadian and Washington fisheries over the last four cycle years, and a geographic breakdown of Canadian First Nations catches for Fraser sockeye and pink salmon. Sockeye salmon escapements for the last five years on the 2005 cycle are summarized by management group in Table 12 and by stock in Appendix K (Table 13), while pink salmon production since 1961 is shown in Appendix K (Table 14).

A. Sockeye Salmon

For sockeye salmon, the total return was 7,077,000 fish (very similar to the brood year return of 7,213,000 sockeye in 2001), with a catch of 1,755,000 fish, spawning escapement of 3,361,000 fish and DBE of 1,961,000 fish (Table 8). The total adult return of 7,024,000 fish (Table 9) was about half the pre-season 50% probability level forecast of 12,548,000 fish, between the 80-90% probability level forecasts (7,931,000 - 6,247,000 fish, Appendix C). In the previous ten returns on this cycle line, sockeye abundance has ranged from a low of 3,167,000 fish in 1965, built up to a peak abundance of 23,631,000 fish in 1993, then declined to its current level of about 7,000,000 fish in 2001 and 2005 (Figure 6).

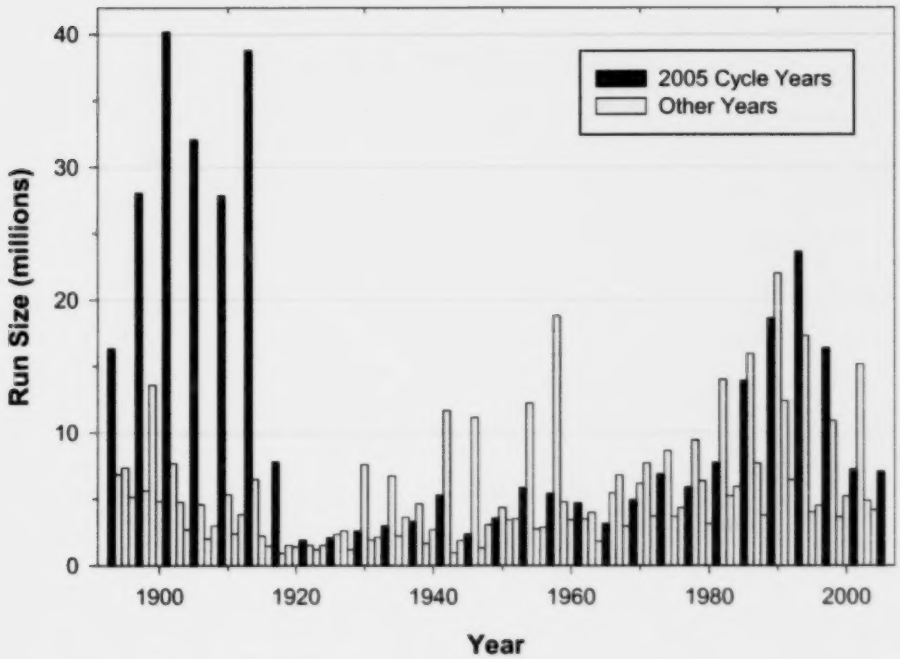


Figure 6. Total run size of Fraser River sockeye salmon between 1893-2005. Returns on the 2005 cycle are emphasized.

The total catch of 1,755,000 fish was only 25% of the run, leaving 75% potentially available for spawning escapement (Table 8). This low exploitation rate is consistent with the strong trend towards lower exploitation rates since the mid 1990s (Figure 7). Between 1984-1994, exploitation rates averaged 76%, compared to 33% between 1998-2005 when sockeye harvest was constrained by Late-run conservation concerns and Canada's sockeye rebuilding strategy. Conversely, the total escapement of 5,322,000 fish (i.e., total run minus total catch = 7,077,000 - 1,755,000) was the third highest percentage (75%) on record, with only 1999 (85%) and 2001 (78%) showing higher fractions of uncaught fish. Given the DBE of 28% (1,961,000 fish) the actual spawning escapement of 3,361,000 fish (including 3,308,000 adults and 53,000 jacks) was, however, only 47% of the run.

Table 8. Catch, escapement, DBE and run size estimates for Fraser River sockeye (by management group) and pink salmon in 2005.

	Fraser Sockeye							Fraser Pinks	
	Early Stuart	Early Summer	Summer	Birken -head	Late	Total	% of Run	Total	% of Run
CANADIAN CATCH									
Panel Area	0	200	2,800	100	300	3,400	0%	1,100	0%
Non-Panel Areas	0	1,300	112,800	4,200	7,700	126,000	2%	124,200	1%
Commercial Catch	**0**	**1,500**	**115,600**	**4,300**	**7,900**	**129,400**	2%	**125,300**	1%
Marine FSC *	0	25,700	225,500	5,500	9,900	266,600	4%	182,500	2%
Fraser River FSC *	17,800	65,800	570,300	3,400	26,900	684,200	10%	53,700	1%
Economic Opportunity	0	700	4,500	200	100	5,500	0%	211,500	2%
First Nations Catch	**17,800**	**92,200**	**800,300**	**9,100**	**36,900**	**956,200**	14%	**447,700**	4%
Marine Recreational	100	500	5,600	100	700	7,000		47,000	
Fraser Recreational	0	2,700	39,600	0	400	42,600		17,400	
Charter	0	100	600	0	100	700		0	
ESSR **	0	0	0	0	6,600	6,600		0	
Non-commercial Catch	**100**	**3,300**	**45,800**	**100**	**7,700**	**57,000**	1%	**64,400**	1%
Canadian Total	**17,900**	**97,000**	**961,700**	**13,500**	**52,500**	**1,142,600**	16%	**637,400**	6%
UNITED STATES CATCH									
Treaty Indian	0	8,700	122,600	1,900	5,600	138,900	2%	182,700	2%
Non-Indian	0	2,400	55,400	800	2,500	61,200	1%	134,100	1%
Commercial catch	**0**	**11,100**	**178,000**	**2,600**	**8,300**	**200,000**	3%	**316,800**	3%
Ceremonial	0	100	700	0	200	1,000		100	
Recreational	0	0	0	0	0	0		21,500	
Non-commercial Catch	**0**	**100**	**700**	**0**	**200**	**1,000**	0%	**21,600**	0%
Washington Total	0	11,300	178,700	2,600	8,400	201,000	3%	338,400	3%
Alaska	1,700	20,700	264,000	2,300	5,500	294,300	4%	0	0%
United States Total	**1,700**	**32,000**	**442,700**	**5,000**	**13,900**	**495,300**	7%	**338,400**	3%
TEST FISHING CATCH									
Canada	1,200	5,900	31,600	300	3,200	42,200		13,500	
United States	100	1,400	3,800	0	500	5,800		500	
Commission (Panel Areas)	1,200	7,400	35,400	300	3,700	48,000	1%	13,900	0%
Canada (non-Panel Areas))	700	6,900	57,200	1,900	2,900	69,500	1%	70,700	1%
Test Fishing Total	**1,900**	**14,200**	**92,700**	**2,200**	**6,600**	**117,500**	2%	**84,600**	1%
TOTAL CATCH, ESCAPEMENT, DBEs AND RUN									
Total Catch in All Fisheries	21,500	143,200	1,497,100	20,700	72,900	1,755,400	25%	1,060,400	11%
Spawning Escapement	98,500	228,900	2,459,600	60,000	513,700	3,360,800	47%	8,939,600	89%
Differences between Estimates	99,700	249,800	1,443,400	83,400	84,700	1,961,000	28%	0	0%
Total Run	**219,700**	**621,900**	**5,400,100**	**164,100**	**671,400**	**7,077,200**	100%	**10,000,000**	100%
Gross Escapement	216,000	547,900	4,517,400	147,000	632,400	6,060,700		9,222,200	
Total Catch in All Fisheries	10%	23%	28%	13%	11%	25%		11%	
Spawning Escapement	45%	37%	46%	37%	77%	47%		89%	
Differences between Estimates	45%	40%	27%	51%	13%	28%		0%	
Total Run	100%	100%	100%	100%	100%	100%		100%	

* FSC = Food, Social and Ceremonial fisheries.

** Harvest of Weaver Creek sockeye in the terminal area that were Excess Salmon to Spawning Requirements (ESSR).

Table 9. Catch, escapement, DBE, run size and exploitation rate estimates for Fraser River sockeye (by stock group) and pink salmon in 2005.

Stock Group	Catch	Spawning Escapement	Difference * Between Estimates	Run Size			Portion of Run	Adult Exploitation Rate
				Adult	Jacks	Total		
Sockeye Salmon								
Early Stuart	21,500	98,500	99,700	219,700	0	219,700	3%	10%
Early Summer-run								
Chilliwack	400	3,400	1,100	4,900	0	4,900	<1%	8%
Early Miscellaneous	115,200	149,900	228,500	493,500	1,500	495,000	7%	23%
Seymour/Scotch	12,700	9,400	20,200	42,400	2,600	45,000	1%	30%
Pitt	14,900	62,000	0	76,900	15	77,000	1%	19%
Total	143,200	224,700	249,800	617,800	4,100	621,900	9%	23%
Summer-run								
Chilko	347,900	536,000	187,100	1,071,000	4,500	1,075,500	15%	32%
Quesnel	885,700	1,450,200 *1*	1,256,300	3,592,100	38	3,592,200	51%	25%
Late Stuart/Stellako	263,500	468,800	0	732,300	67	732,400	10%	36%
Total	1,497,100	2,455,000	1,443,400	5,395,500	4,600	5,400,100	76%	28%
Birkenhead	20,700	58,900	83,400	163,000	1,100	164,100	2%	13%
Late-run								
Late Shuswap/Portage	18,400	33,200	0	51,600	42,200	93,900	1%	36%
Weaver/Cultus	22,000 *2*	48,700 *3*	84,800	155,500	500 *3*	156,000	2%	14%
Harrison	32,500	388,900	0	421,400	200	421,600	6%	8%
Total	72,900	470,800	84,800	628,500	42,900	671,400	9%	12%
Total Adults	1,755,500	3,308,000	1,961,000	7,024,400	52,800	7,077,200	100%	25%
Total Jacks *4*	0	52,831	0	52,831				
Total	1,755,500	3,360,800	1,961,000	7,077,200				
Portion of Total Run	25%	47%	28%	100%				
Pink Salmon								
Total	1,060,400	8,939,600	-	10,000,000				11%
Portion of Total Run	11%	89%	-	100%				

* Differences between gross escapement estimates are the positive results of lower river estimates (Mission + IF catch, PSC) minus up-river estimates (spawning escapement + IF catch + sport catch + ESSR catch, DFO). Negative differences are assumed to be zero.

1 Escapement to Mitchell River and other Quesnel stocks were not enumerated and so were indirectly estimated. Spawning escapements throughout the Horsefly River system in the brood year (2001) were used to proportionally expand estimates from the enumerated stocks in 2005 to the entire watershed, adding 553,000 fish to the enumerated population.

2 In-river catch of Weaver sockeye includes ESSR catch of 6,571 sockeye.

3 Includes brookstock catch of 149 Cultus individuals: 81 added as adult spawning escapement and 68 as jack returns.

4 Jack ratios were not estimated for fisheries; estimates include only those jacks that were actually sampled and are therefore underestimates.

Of the total catch, 1,143,000 fish were caught in Canada, 495,000 fish in the U.S. (including 294,000 fish in Alaska) and 118,000 fish in test fisheries (Table 8). Included in the Canadian catch were a commercial harvest of 129,000 fish (almost all in non-Panel Areas), First Nations catch of 956,000 fish, recreational catch of 50,000 fish and ESSR catch of 7,000 fish. The Canadian commercial catch included 3,400 fish caught in an Area 29 protest fishery. Washington State fishers caught 200,000 sockeye in commercial fisheries and 1,000 fish in Treaty Indian ceremonial harvest. More detailed information about commercial catch by gear and area are found in Table 10 for Canadian fisheries and Table 11 for U.S. fisheries.

The total return of Early Stuart sockeye was 220,000 adults (Tables 8 and 9), or 85% of the median pre-season forecast. This total included 18,000 fish caught in Fraser River First Nations fisheries, 1,700 fish caught in Alaska and 1,900 fish caught in test fisheries. Spawning escapements totalled 99,000 adults and the DBE was 100,000 fish. The exploitation rate for all catch areas was 10%.

Early Summer-run returns totalled 618,000 adult sockeye, which was 86% of the median pre-season forecast of 718,000 fish. North Thompson, Raft, Pitt and Nadina stocks were the largest contributors to this run. Catches of Early Summer-run sockeye totalled 143,000 fish, resulting in an overall exploitation rate of 23% and a higher rate for the Scotch/Seymour component than for the earlier-timed stocks. Early Summer-run sockeye encountered warm water conditions that likely caused some en route mortality and contributed to the 250,000 fish DBE. Spawning escapements totalled 225,000 adults.

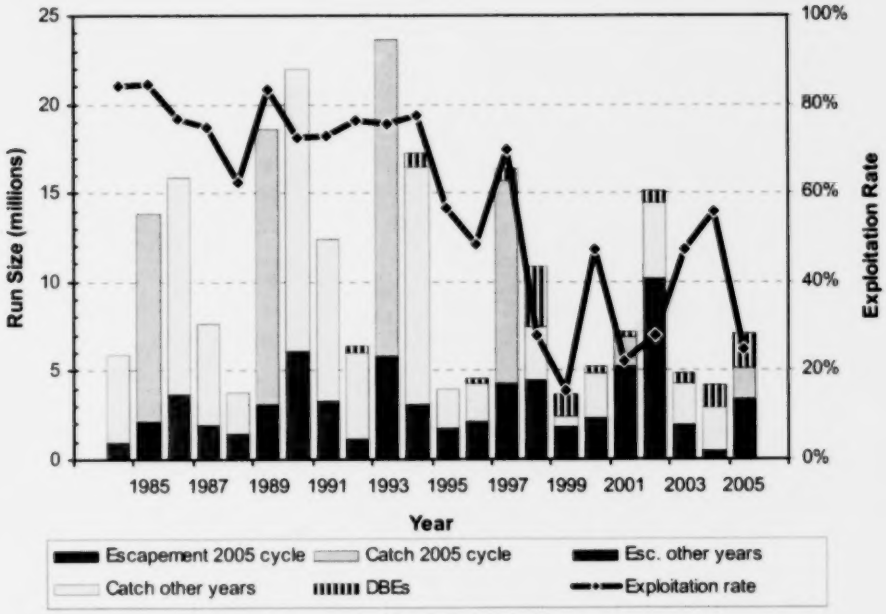


Figure 7. Total run size, catch, escapement, DBEs, and exploitation rate for Fraser River sockeye salmon between 1984-2005, with returns on the 2005 cycle emphasized.

Table 10. Canadian commercial catches of Fraser River sockeye salmon by gear type, license designation and statistical area during the 2005 fishing season. *

	Purse Seine		Gillnet			Troll			
Areas	Area A	Area B	Area C	Area D	Area E	Area F	Area G	Area H	**Total**
1-10	0		0			0			0
11-16		55,800		42,800	7,900		0	19,500	126,000
121-127		0		0			0		0
20		0			0		0		0
17, 18, 29		0			3,400			0	3,400
Selective	0	0	0	0	0	0	0	0	0
Total Catch	0	55,800	0	42,800	11,300	0	0	19,500	129,400

* DFO preliminary post-season catch estimates.

The run size of Summer-run sockeye was 5,396,000 adults (49% of the median pre-season forecast), with the majority belonging to the Quesnel group, followed by the Chilko and Late Stuart/Stellako groups. Catches totalled 1,497,000 fish, resulting in an overall adult exploitation rate of 28%. DBEs totalled 1,443,000 sockeye, mostly in the Quesnel group, compared to a spawning escapement of 2,455,000 adults.

For Birkenhead sockeye the catch, escapement and DBE estimates were 21,000 fish, 59,000 adults and 83,000 fish, respectively, for a total run size of 164,000 adults.

The estimated return of 629,000 Late-run adults was 154% more than the median pre-season forecast of 247,000 fish. The Harrison group was the largest component of the run and was more than four times larger than forecast. Commercial, test and miscellaneous catches of Late-run

stocks totalled 73,000 fish, for an exploitation rate of 11%. The stock-specific exploitation rate was greatest for Late Shuswap/Portage (20% overall and 36% for adults). Late-run sockeye again exhibited early upstream migration behaviour, however, en route mortality related to the early migration was much less severe than in most recent years. Late Shuswap spawning escapement exceeded expectations, with no apparent en route loss. Harrison sockeye similarly showed no evidence of en route mortality, with spawning escapement exceeding the escapement past Mission by a significant amount. However, the spawning escapement of Weaver sockeye was 49,000 fish compared to a potential escapement of 134,000 fish, generating a DBE of 85,000 fish (-63%).

Table 11. U.S. commercial catches of Fraser River sockeye salmon by user group, gear type and statistical area during the 2005 fishing season. *

Areas	Troll	Purse Seine	Gillnet	Reefnet	Total
Treaty Indian					
4B, 5 and 6C	0	0	5,200	0	6,200
6 and 7	0	27,900	10,100	0	38,100
7A	0	36,200	59,400	0	95,600
Total Catch	0	64,100	74,700	0	139,900
Non-Indian					
7	0	9,700	6,100	9,800	25,600
7A	0	23,600	12,000	0	35,500
Total Catch	0	33,300	18,100	9,800	61,200
United States					
Panel Area Total	1,000	97,400	92,800	9,800	200,000
Alaska (District 104) Catch					294,300
Total Catch					495,300

* Washington catches from Washington Department of Fish and Wildlife "soft system".

i. Spawning Escapement

Sockeye spawning escapements in the Fraser River watershed (Figure 8) are enumerated annually by DFO. These spawning escapement estimates are used by Staff to assess the achievement of spawning escapement targets and to obtain final estimates of run size and production by stock, stock group and management group. They are essential for post-season reporting and an important component of historical datasets used for run-size forecasting. Data collected as part of spawning ground enumeration programs (e.g., scales, otoliths, tissue, length) assist in post-season evaluations of stock identification and monitoring programs.

In 2005, the estimate of adult sockeye escapement (primarily age 4 and age 5 fish) totalled 3,308,000 fish, 37% less than the brood year (2001) escapement of 5,257,000 adults (Table 12). Reductions in spawning populations were confined to the Early Stuart, Early Summer and Summer runs. In contrast, the escapement of Birkenhead sockeye was slightly higher than in the brood year and for Late-run sockeye was almost eleven times larger, primarily related to the unexpectedly large return of Harrison sockeye.

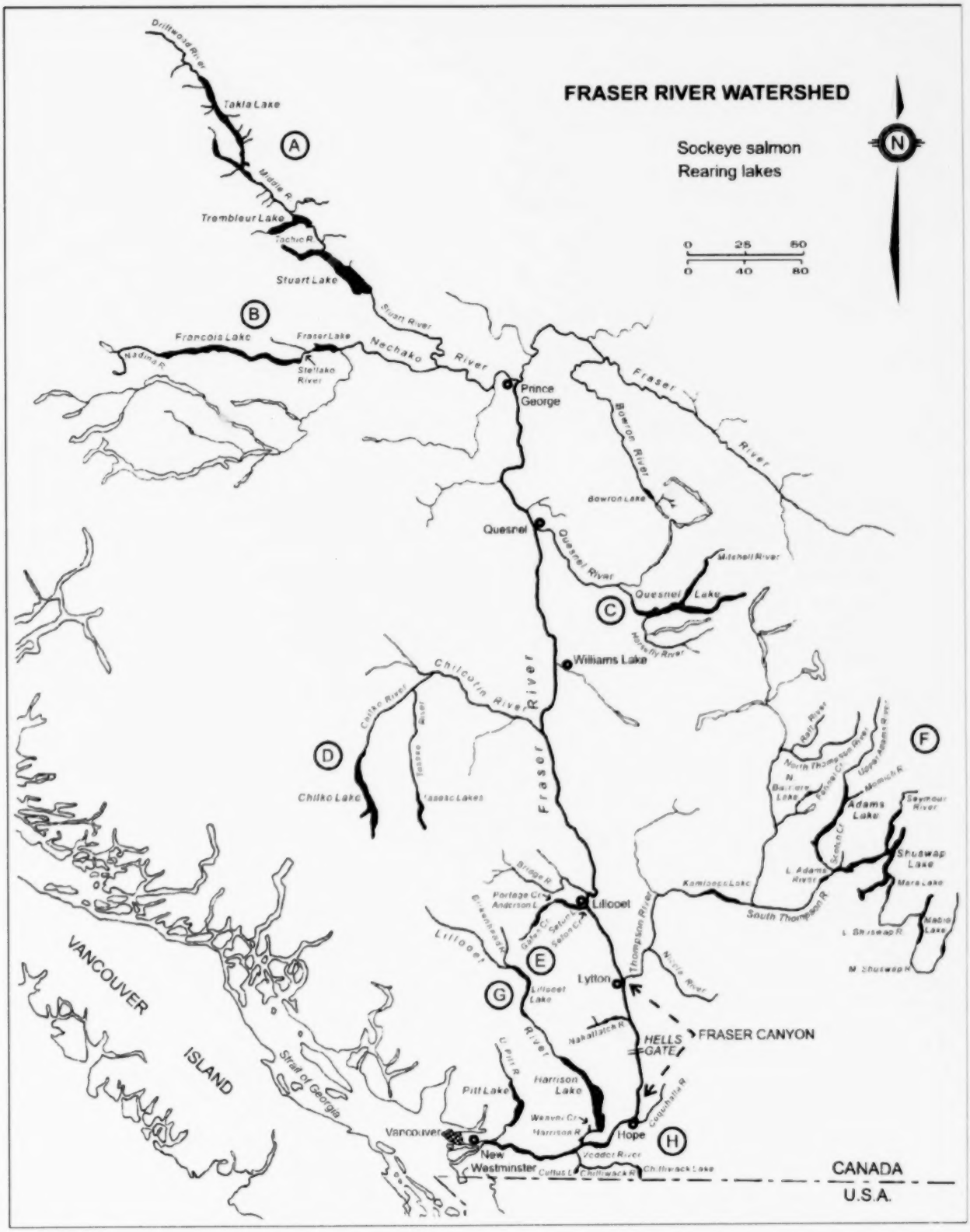


Figure 8. Sockeye salmon spawning grounds in the Fraser River watershed.

Table 12. Adult sockeye salmon spawning escapements by management group on the 2005 cycle for years 1989-2005.

Management Group	Adult Spawning Escapement				
	1989	1993	1997	2001	2005
Early Stuart	385,000	688,000	266,000	171,000	99,000
Early Summer	63,000	86,000	89,000	302,000	225,000
Summer	2,553,000	5,072,000	3,807,000	4,683,000	2,455,000
Birkenhead	30,000	246,000	52,000	57,000	59,000
Late	29,000	110,000	38,000	44,000	471,000
Adults	3,060,000	6,202,000	4,252,000	5,257,000	3,308,000

A longer term view of escapements show that in an historical sense Early Stuart and Summer-run escapements were poor, while Early Summer and Late-run escapements represent increases. Compared to previous escapements on the 2005 cycle the escapement in 2005 was the: (1) lowest since 1965 for Early Stuart sockeye; (2) second highest since records began in 1941 for Early Summer sockeye; (3) lowest since 1985 for Summer-run sockeye; (4) very close to the average since 1941 for Birkenhead sockeye; and (5) more than four times the previous high since at least 1941 for Late-run sockeye.

Spawning was protracted for several Early Stuart, Early Summer and Summer-run stocks in 2005, extending up to three weeks later than normal. This was consistent with the very late marine timing that was observed for these sockeye, and may be partially due to their generally smaller than average body size and slower swimming speed.

The overall spawning success of adult female sockeye salmon in the Fraser River watershed in 2005 was over 99%, which was higher than the overall spawning success in 2001 of 93%. The overall effective female spawning population in 2005 totalled 1,801,000 fish and represented approximately 64% of the effective females that escaped to the Fraser watershed in 2001.

B. Pink Salmon

Because pink salmon spawners are not enumerated, it is not possible to obtain a post-season run size that is the sum of total catch plus spawning escapement as is done for sockeye salmon. Instead, the total catch of 1,060,000 Fraser pink salmon in all fisheries was subtracted from the in-season run-size estimate of 10,000,000 fish, leaving an indirect spawning escapement estimate of 8,940,000 fish (Tables 8 and 9). The run-size estimate was 61% of the median pre-season forecast of 16,318,000 fish (Appendix C). Returns of Fraser pink salmon have shown large variation in recent years, with the lowest return in about 30 years occurring in 1999 (3,600,000 fish), followed four years later in 2003 with the highest return in at least 44 years (26,000,000 fish). The 2005 return was slightly lower than the average return since 1959 (12,000,000 fish) and about two thirds of the more recent average since 1979 (15,600,000 fish, Figure 9).

The total catch of 1,060,000 fish represents an exploitation rate of only 11%. There has been an even more pronounced reduction in exploitation rates for pink salmon than for sockeye salmon, with an average of 7% since 1999 compared to 63% before 1999 (Figure 9). The low exploitation rates in recent years are partly the result of conservation concerns for Late-run sockeye, but also reflect the impact of low demand and low prices for pink salmon, and high fuel costs. These low harvest levels have resulted in substantial spawning escapements in recent years, although the escapement in 2005 is not particularly large because of the relatively low run size.

Of the total catch, 637,000 fish were caught in Canada, 338,000 fish in the U.S. and 85,000 fish in test fisheries (Table 8). Included in the Canadian catch were a commercial harvest of 125,000 fish (almost all in non-Panel Areas), First Nations catch of 448,000 fish and recreational catch of 64,000 fish. U.S. catches included 317,000 pinks in commercial fisheries and 22,000 fish in recreational fisheries. More detailed information about Canadian and U.S. commercial catches by gear and area are found in Tables 13 and 14, respectively.

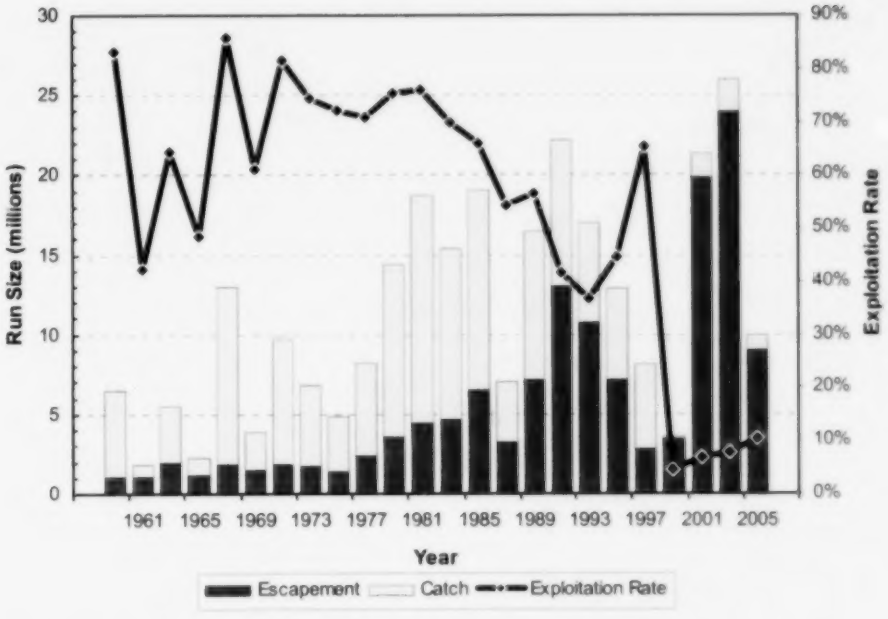


Figure 9. Total run size, catch, escapement and exploitation rate for Fraser River pink salmon between 1959-2005.

Table 13. Canadian commercial catches of Fraser River pink salmon by gear type, license designation and statistical area during the 2005 fishing season. *

	Purse Seine		Gillnet			Troll			
Areas	Area A	Area B	Area C	Area D	Area E	Area F	Area G	Area H	**Total**
1-10	0		0			0			0
11-16		91,200		9,000	2,400		0	21,600	124,200
121-127		0		0			0		0
20		0			0		0		0
17, 18, 29		0			1,100			0	1,100
Selective	0	0	0	0	0	0	0	0	0
Total Catch	0	91,200	0	9,000	3,500	0	0	21,600	125,300

* Catch data from DFO ticket sales slips.

Table 14. U.S. commercial catches of Fraser River pink salmon by user group, gear type and statistical area during the 2005 fishing season. *

Areas	Troll	Purse Seine	Gillnet	Reefnet	Total
Treaty Indian					
4B, 5 and 6C	0	0	4,500	0	4,500
6 and 7	0	38,400	2,600	0	40,900
7A	0	119,000	18,300	0	137,300
Total Catch	0	157,300	25,300	0	182,700
Non-Indian					
7	0	18,500	1,200	11,800	31,500
7A	0	98,100	4,500	0	102,600
Total Catch	0	116,600	5,700	11,800	134,100
United States					
Panel Area Total	0	273,900	31,000	11,800	316,800
Non-Panel Area Total					0
Total Catch					316,800

* Washington catch data from Washington Department of Fish and Wildlife "soft system".

VI. ACHIEVEMENT OF OBJECTIVES

The mandate of the Fraser River Panel is to manage commercial fisheries in the Panel Area to achieve a hierarchy of annual goals. In order of importance, the goals are to: (a) achieve spawning escapement targets for Fraser River sockeye and pink salmon that are set by Canada or modified by Panel agreement; (b) achieve targets for international sharing of the TAC as defined in the Treaty or by agreement of the Parties; and (c) achieve domestic catch allocation goals within each country. In the process of achieving these objectives, the Panel must consider conservation concerns for other stocks and species of salmon when planning and conducting fisheries. Panel management strategies are assessed after each season to determine whether the goals were achieved and to identify data collection programs, assessment methods and management techniques that could be improved.

On February 17, 2005, the Panel agreed on a revised Chapter 4, Annex IV of the Pacific Salmon Treaty. The revised Annex established new methods for making management decisions, and for calculating the TAC and paybacks from 2005 onward. Whereas the traditional method used post-season estimates of run size, spawning escapement and test fishing catch in the calculation, the new method uses the estimates of run size, spawning escapement target, management adjustment and test fishing catch that were in effect when the Panel relinquished control of the last U.S. Panel Area (October 8 in 2005). The new method is therefore based on in-season rather than post-season data to calculate the total Fraser sockeye and pink salmon available for sharing.

A. Escapement

The Panel's first task is to achieve spawning escapement targets as specified by Canada. Spawning escapement targets for Early Stuart, Early Summer and Summer-run sockeye were determined by applying Canada's spawning escapement plan to the post-season run-size estimates for each group. The objective (as a percentage of run size) established for Summer-run sockeye was also applied to the Birkenhead component of the Late-run.

In-season management is based on targets for potential spawning escapement (PSE), which include spawning escapement targets plus MAs. This is partly because the Panel's mandate extends only to commercial fisheries, which have an upriver boundary at Mission, BC, in the lower Fraser River. Furthermore, in-season monitoring of the progress toward PSE targets is more practical because of the large time lags between management actions and salmon arriving on the spawning grounds. Based on final in-season PSE estimates (i.e., Mission escapement minus First Nations and recreational catches above Mission), in-season PSE estimates were slightly under the

targets for Early Stuart and Early Summer runs (-3 to -9%), and for the other management groups exceeded the targets by wide margins (42% to 53%, Table 15). These results show that the Panel was generally successful in delivering fish from all stocks into the river in the form of potential spawning escapements, especially for the later management groups.

Table 15. Comparison of in-season potential escapement targets (i.e., spawning escapement target plus MA) at the time the Panel relinquished control of the last U.S. Panel Area (October 8) and in-season PSE estimates (i.e., Mission escapement minus catch above Mission) for Fraser River sockeye salmon in 2005.

	Potential Spawning Escapement					
Management Group	Spawning Escapement Target	Management Adjustment *	Adjusted Target	In-season Estimate**	Difference Fish	Difference %
Early Stuart	164,000	44,000	208,000	189,000	-19,000	-9%
Early Summer	395,000	327,000	722,000	701,000	-21,000	-3%
Summer	4,006,000	80,000	4,086,000	6,105,000	2,019,000	49%
Birkenhead	115,000	0	115,000	176,000	61,000	53%
Late ***	476,000	0	476,000	677,000	201,000	42%
Adult sockeye	5,156,000	451,000	5,607,000	7,848,000	2,241,000	40%

* Adjustment of spawning escapement targets to achieve spawning escapement goals.
** Mission escapement estimate minus all catch above Mission.
*** Late-run escapement target is the nominal target calculated by subtraction of the 15% Exploitation Rate Limit.

Post-season spawning escapement targets for all management groups excluding the Late run are shown in Table 16, along with spawning ground estimates of escapement. Spawning escapements were well below the targets (-27% to -43%) for these groups. The Late run was excluded from this comparison because Late-run management was driven by an exploitation rate limit rather than an escapement target, as described in the next section (i.e., "Late-run Objective").

Table 16. Comparison of post-season spawning escapement targets and upriver escapement estimates for adult Fraser River sockeye (excluding the Late-run group) and pink salmon in 2005. Upriver estimates of sockeye spawners are from spawning ground enumeration programs (DFO), while pink salmon spawners were estimated by subtracting total catch from the in-season abundance estimate.

	Adult Spawning Escapement			
Management Group	Post-season Target	Upriver Estimate	Difference Fish	Difference %
Early Stuart	171,000	99,000	-72,000	-42%
Early Summer	322,000	225,000	-97,000	-30%
Summer	3,375,000	2,455,000	-920,000	-27%
Birkenhead	103,000	59,000	-44,000	-43%
Adult sockeye	3,971,000	2,838,000	-1,133,000	-29%
Pink salmon	6,000,000	8,940,000 **	2,940,000	49%

** Pink salmon escapement estimated by subtracting the total catch from the in-season run-size estimate.

The shortfalls in spawning escapement (Table 16) for the Early Stuart through Birkenhead groups reflect a large loss. For Early Stuart, both the TAC and Aboriginal Fishery Exemption were zero, so part of the loss can be explained by the catch of 18,000 fish in Fraser River First Nations fisheries. Similarly, the catch above Mission of Early Summer fish was larger than planned. However, the apparent losses remain larger than these catches.

There are several possible reasons for the shortfalls in spawning escapement. First, over-estimates of total return during the in-season management period may have resulted in catch targets and thereby catches that were too high. Second, the in-season MAs adopted by the Panel may have been too small to compensate for the observed differences between estimates (DBEs). Third, underestimates on the spawning grounds may have given a misleading impression of escapement shortfalls. This latter reason is not discussed further since there is no evidence that suggests it was a significant problem in 2005. These possible reasons are not mutually exclusive,

so a complete assessment of the escapement shortfalls could involve any or all of these factors in combination. To explain the potential contributions of these factors to escapement shortfalls we compared in-season and post-season estimates of available harvest (i.e., total abundance minus spawning escapement target and MA, Table 17), and in-season expected DBEs with observed DBEs (Table 18). We used all post-season data to calculate the post-season available harvest in Table 17, except that in-season MA factors were applied to post-season spawning escapement targets to estimate the management adjustments.

For Early Stuart sockeye, in-season and post-season estimates of both the spawning escapement target and MA were very similar (Table 17), but because the total return was much less than the total target plus adjustment the available harvest was zero. Thus, 21,500 (the total catch) of the 72,000 fish escapement shortfall (Table 16) can be attributed to a catch overage, but the overage cannot be attributed to in-season assessment errors since in-season and post-season available harvests were very similar. The observed DBE of -50% for Early Stuart was only about 8% larger than was predicted by the in-season MA model (Table 18), so the difference between in-season and observed %DBEs was not a major causal factor in the escapement shortfall. However, given the observed DBE of -50%, a potential escapement that was double the escapement target (2 x 171,000 fish = 342,000 fish) would have been required to achieve the spawning escapement target. This potential spawning escapement was not achievable given the total return of only 218,000 fish. The main cause the escapement shortfall for Early Stuart was therefore a total return that was insufficient to compensate for the observed %DBE.

Early Summer spawning escapements were 97,000 fish less than the post-season target (Table 16). In-season assessments overestimated the total return and available harvest, while the catch of 143,000 fish exceeded the post-season estimate of available harvest (34,000 fish, Table 17) by 109,000 fish. About half of the catch overage could be attributed to in-season abundance assessment errors, as the post-season available harvest was 44,000 fish less than the in-season value. The larger in-season available harvest resulted from overestimates of total return related to the species composition bias at Mission (Appendix J). The observed DBE for the entire Early Summer group including Pitt (-53%) was 8% larger than the in-season estimate (-45%, Table 18). Given the observed %DBE, a total return of over 686,000 fish (compared to the run size of 622,000 fish) would have been required to achieve the spawning escapement target of 322,000 fish, so even if no catch had been taken the spawning escapement target would not have been achieved. Thus, the escapement shortfall for Early-Summer sockeye was due to the combined effects of overharvest related to over-estimates of in-season abundance, and an abundance that was too small to achieve the target given the larger than expected DBE.

In-season assessments of Summer-run sockeye also overestimated the total return, but the actual catch of 1,497,000 fish was far less than both the in-season and post-season estimates of available harvest (Table 17). Overharvest was therefore not responsible for the 27% shortfall in Summer-run escapement (Table 16). Summer-run sockeye, however, suffered a large DBE of -37% in spite of benign river temperatures that historically would have resulted in virtually no difference (-2%) in estimates (Table 18). This large DBE is the major cause of the escapement shortfall. Given the large DBE of -37%, it would have been necessary for almost the entire run to escape in order for the spawning escapement target to be achieved.

Table 17. Comparison of in-season and post-season calculations of available harvest (i.e., run size minus spawning escapement target and management adjustment).

Management Group	Total Abundance	Spawning Escapement Target	Proportional Management Adjustment	Management Adjustment	Available Harvest
In-season					
Early Stuart	210,000	164,000	0.72	118,000	0
Early Summer	800,000	395,000	0.8272	327,000	78,000
Summer	7,000,000	4,006,000	0.02	80,000	2,914,000
Birkenhead	200,000	114,000		0	86,000
Sockeye	**8,210,000**	**4,679,000**		**525,000**	**3,078,000**
Pink	**10,000,000**	**6,000,000**		**0**	**4,000,000**
Post-season					
Early Stuart	220,000	171,000	0.72	123,000	0
Early Summer	622,000	322,000	0.8272	266,000	34,000
Summer	5,400,000	3,375,000	0.02	68,000	1,958,000
Birkenhead	164,000	103,000		0	61,000
Sockeye	**6,406,000**	**3,971,000**		**457,000**	**2,053,000**
Pink	**10,000,000**	**6,000,000**		**0**	**4,000,000**

Table 18. Comparison of predicted and observed DBE and spawning escapement estimates in 2005 for Early Stuart, Early Summer and Summer runs. In-season predictions of %DBEs from the MA models are provided for comparison with observed values. In-season predictions of %DBEs are based on assessments of migration timing and corresponding mean Fraser River discharge and temperature during the early and peak portion of the run (19 day period). Observed DBEs are obtained by a simple subtraction of post-season potential spawning escapement (Mission escapement minus catch above Mission) from the adult escapement enumerated on the spawning grounds.

	Potential * Spawning Escapement	Difference between Estimates		Adult Spawning Escapement
		%	Fish	
Early Stuart				
In-season MA prediction **	198,000	-42%	-83,000	115,000
Observed ***	198,000	-50%	-99,000	99,000
Early Summer				
In-season MA prediction **	479,000	-45%	-217,000	262,000
Observed ***	479,000	-53%	-254,000	225,000
Summer				
In-season MA prediction **	3,886,000	-2%	-76,000	3,810,000
Observed ***	3,886,000	-37%	-1,431,000	2,455,000

* Post-season potential spawning escapement (i.e., Mission escapement minus catch above Mission).
** Prediction of %DBE based on in-season estimates of migration timing and environmental variables.
*** Mission-based potential spawning escapement compared to spawning ground estimates.

The cause of the larger than expected DBEs, especially for Summer-run sockeye, are unknown. However, such large DBEs could relate to the extremely late migration of all Fraser sockeye runs compared to their historical timing, which may have reduced their migration success through some biological process. For example, if such late-arriving sockeye were low on energy reserves, more susceptible to migration stresses or disease, or strayed into unmonitored non-natal streams, then elevated levels of en route mortality may have occurred. River conditions that relate to migration success were in ranges generally considered benign, particularly for Summer-run fish. Thus, if elevated mortality levels occurred they may not have been due to the same processes observed in years when high discharge or temperature levels led to high en route mortality. A radio tagging program confirmed the levels of en route loss but information was insufficient to determine causal mechanisms.

In summary, only tentative conclusions can be made about what may have caused the escapement shortfall in 2005. A rigorous quantitative assessment that would allow the shortfalls to be apportioned among the many potential causative factors with certainty is not possible with the current information.

The escapement of Fraser River pink salmon, which was estimated by subtracting total catch from the in-season run-size estimate, exceeded the spawning escapement target of 6,000,000 fish by about 3,000,000 fish (Table 16).

B. Late-run Objective

To protect the spawning escapement of Late-run sockeye against the effects of the early in-river migration observed since about 1996, the Panel agreed to limit the harvest of these stocks to a maximum of 15% of the run. At a post-season abundance of 629,000 adults and a corresponding harvest limit of 94,000 fish, the catch of 73,000 Late-run fish was 21,000 fish or 3.4% below the limit (Table 19). While no explicit spawning escapement objective was provided for Late-run sockeye, the 15% harvest limit implied a nominal spawning escapement target of 85% of the run. Because high levels of en route mortality were expected, significantly less than 85% of the run was anticipated to actually reach the spawning grounds. Despite expected in-river mortalities, the Late-run spawning escapement was 471,000 adults compared to the nominal target of 571,000 fish.

Table 19. Comparison of total catch to the 15% exploitation rate limit for Late-run sockeye in 2005.

Item	% of Run	Fish
Late-run Adult Abundance (post-season)		629,000
Exploitation rate limit	15.0%	94,000
Catch	11.6%	72,900
Balance	3.4%	21,100

C. International Allocation

The Panel's second priority is to achieve the goals for international allocation of the TAC. In accordance with the February 17, 2005, Panel agreement, the TAC calculation is based on the estimates available on October 8, when Panel control of the last U.S. Panel Area was relinquished.

With the total run-size estimate of 8,770,000 Fraser sockeye, minus deductions for spawning escapement, management adjustment, Fraser River Aboriginal Fishery Exemption and test fishing catch, the TAC in 2005 was 2,646,000 sockeye (Table 20). There were no paybacks to carry forward from 2004, so the U.S. share in Panel Areas (Washington) was simply 16.5% of the TAC or 437,000 fish compared to a catch of 201,000 sockeye. This leaves a U.S. catch shortfall of 236,000 sockeye. The Canadian share is the balance of the TAC plus the Aboriginal Fishery Exemption for a total share of 2,610,000 sockeye. Canadian fishers caught 1,143,000 sockeye, leaving a catch shortfall of 1,467,000 sockeye. While combined catches by both countries of Early Stuart and Early Summer sockeye exceeded the available harvests, catches of Summer, Birkenhead and Late-run sockeye were substantially less than the numbers available.

In regards to Fraser River pink salmon, the run-size estimate was 10,000,000 fish and the TAC was 3,990,000 fish. The U.S. share of pink salmon was 25.7% of the TAC (1,025,000 fish) and Washington fishers caught 338,000 fish, leaving a catch shortfall of 687,000 fish. Canadian fishers caught 637,000 fish, leaving a catch shortfall of 2,327,000 pink salmon. The overall catch of Fraser pinks was about 3,000,000 fish less than the TAC.

Table 20. Calculations of total allowable catch and international shares for Fraser River sockeye and pink salmon in 2005. In-season estimates of run size, spawning escapement target, management adjustment and test fishing catch at the time the Panel relinquished control of the last U.S. Panel Area (October 8) were used, according to the revised Annex IV agreed to on Feb. 17, 2005.

2005 TAC Calculations	Fraser Sockeye						Fraser Pinks	
	Early Stuart	Early Summer	Summer	Birken -head	Late	Total		
RUN STATUS, ESCAPEMENT NEEDS & AVAILABLE SURPLUS								
In-season Run-size Estimate	**210,000**	**800,000**	**7,000,000**	**200,000**	**560,000**	**8,770,000**	**10,000,000**	
Spawning Escapement Target (SET)	**164,000**	**395,000**	**4,006,000**	**114,000**	**476,000**	**5,155,000**	**6,000,000**	
Management Adjustment (MA)	**118,000**	**327,000**	**80,000**	**0**	**0**	**525,000**	0	
Proportional MA (pMA)	0.72	0.8272	0.02	0	0		0	
Adjusted Spn. Esc. Target	210,000	722,000	4,086,000	114,000	476,000	5,608,000	6,000,000	
Test Fishing (TF)	**2,000**	**14,000**	**93,000**	**2,000**	**7,000**	**118,000**	**10,000**	
Surplus above Adjusted SET & TF	0	64,000	2,821,000	84,000	77,000	3,046,000	3,990,000	
DEDUCTIONS & TAC FOR INTERNATIONAL SHARING								
Aboriginal Fishery Exemption (AFE)	**0**	**22,900**	**369,800**	**3,700**	**3,600**	**400,000**	**0**	
Available AFE	0	22,900	369,800	3,700	3,600	400,000	0	
Total Deductions (Adj.SET+TF+AFE)	212,000	758,900	4,548,800	119,700	486,600	6,126,000	6,010,000	
Available TAC	**0**	**41,100**	**2,451,200**	**80,300**	**73,400**	**2,646,000**	**3,990,000**	
UNITED STATES (Washington) TAC								
U.S. Share *	**0**	**6,800**	**404,400**	**13,200**	**12,100**	**436,500** 16.5%	**1,025,400** 25.7%	
Washington Catch	0	11,300	178,700	2,600	8,400	201,000	338,400	
Balance	0	-4,500	225,700	10,600	3,700	235,500	687,000	
CANADA TAC								
Canadian Share	0	34,300	2,046,800	67,100	61,300	2,209,500 83.5%	2,964,600 74.3%	
Available AFE	0	22,900	369,800	3,700	3,600	400,000	0	
Canadian Share + AFE	**0**	**57,200**	**2,416,600**	**70,800**	**64,900**	**2,609,500**	**2,964,600**	
Catch	17,900	97,000	961,700	13,500	52,500	1,142,600	637,400	
Balance	-17,900	-39,800	1,454,900	57,300	12,400	1,466,900	2,327,200	
TOTAL								
Available TAC + AFE	**0**	**64,000**	**2,821,000**	**84,000**	**77,000**	**3,046,000**	**3,990,000**	
Total U.S. + Canadian Catch	17,900	108,300	1,140,400	16,100	60,900	1,343,600	975,800	
Balance	-17,900	-44,300	1,680,600	67,900	16,100	1,702,400	3,014,200	

* Washington sockeye and pink shares according to Annex IV of the Pacific Salmon Treaty.

D. Domestic Allocation

The third priority of the Panel is to achieve domestic allocation goals as specified by the Parties. While the Panel manages all commercial fisheries directed at Fraser River sockeye and pink salmon in Washington waters and Canadian Panel Areas, Canada has sole responsibility for regulating several of its fisheries including commercial net and troll fisheries in Non-Panel areas such as Johnstone Strait, and First Nations and recreational fisheries in all fishery areas. Thus, achievement of Canadian domestic allocation goals requires coordination between Panel and non-Panel regulatory actions.

With respect to domestic allocations of Fraser sockeye, Treaty Indian fishers in Washington caught 156,000 fish below their share of the U.S. TAC and Non-Indian fishers caught 80,000 fish below their share (Table 21). In Canada, Area B purse seines were 6,600 fish under, Area D gillnets were 23,800 fish over, Area E gillnets were 22,700 fish under and Area H trollers were 5,500 fish over their respective allocations (Table 22).

In terms of domestic catch goals for Fraser pink salmon, the U.S. share of the TAC was to be split equally between Treaty Indian and Non-Indian groups. Treaty Indian fishers caught 330,000

fish less and Non-Indian fishers caught 357,000 fish less than their shares (Table 23). In Canada, Area B purse seines were 3,200 fish over, Area D gillnets were 4,000 fish over, Area E gillnets were 2,500 fish over, Area G trollers were 15,300 under and Area H trollers were 5,600 fish over their respective allocations of Fraser River pink salmon (Table 24).

Table 21. Estimates of domestic overages and underages in Washington catches of Fraser River sockeye salmon in 2005.

User Category	Share of TAC		Actual Catch		Balance
	Fish	%	Fish	%	
Treaty Indian *	295,500	67.7%	139,900	69.6%	155,600
Non-Indian **	141,000	32.3%	61,200	30.4%	79,800
Washington Total:	436,500	100.0%	201,100	100.0%	235,400

* Treaty Indian catch includes commercial and ceremonial catches.

** Non-Indian catch includes commercial and recreational catches.

Table 22. Estimates of domestic overages and underages in Canadian catches of Fraser River sockeye salmon in 2005.

Gear License Area	Catch Goals		Actual Catch		Balance
	Fish	%	Fish	%	
Purse Seine					
A Northern	0	0.0%	0	0.0%	0
B Southern	62,400	48.0%	55,800	43.1%	6,600
Total	62,400	48.0%	55,800	43.1%	6,600
Gillnet					
D Johnstone Strait	19,000	14.5%	42,800	33.1%	-23,800
E Fraser River	34,000	26.5%	11,300	8.7%	22,700
Total	53,000	41.0%	54,100	41.8%	-1,100
Troll					
F Northern	0	0.0%	0	0.0%	0
G Southern	0	0.0%	0	0.0%	0
H Inside	14,000	11.0%	19,500	15.1%	-5,500
Total	14,000	11.0%	19,500	15.1%	-5,500
Total	129,400	100.0%	129,400	100.0%	0

Table 23. Estimates of domestic overages and underages in Washington catches of Fraser River pink salmon in 2005.

User Category	Share of TAC		Actual Catch		Balance
	Fish	%	Fish	%	
Treaty Indian *	512,700	50%	182,800	54%	329,900
Non-Indian **	512,700	50%	155,600	46%	357,100
Washington Total:	1,025,400	100%	338,400	100%	687,000

* Treaty Indian catch includes commercial and ceremonial catches.

** Non-Indian catch includes commercial and recreational catches.

Table 24. Estimates of domestic overages and underages in Canadian catches of Fraser River pink salmon in 2005.

Gear License Area	Catch Goals Fish	%	Actual Catch Fish	%	Balance
Purse Seine					
A Northern	0	0%	0	0%	0
B Southern	88,000	70%	91,239	73%	-3,200
Total	88,000	70%	91,239	73%	-3,200
Gillnet					
D Johnstone Strait	5,000	4%	8,965	7%	-4,000
E Fraser River	1,000	1%	3,507	3%	-2,500
Total	6,000	5%	12,472	10%	-6,500
Troll					
F Northern	0	0%	0	0%	0
G Southern	15,294	12%	0	0%	15,300
H Inside	16,000	13%	21,583	17%	-5,600
Total	31,294	25%	21,583	17%	9,700
Total	125,294	100%	125,294	100%	0

E. Conservation of Other Stocks and Species

Catches of non-target stocks and species in Panel Area fisheries directed at Fraser River sockeye and pink salmon were low (Table 25). The recorded by-catches totalled 1,100 non-Fraser sockeye, 23,000 non-Fraser pink, 4,400 chinook, 1,500 coho, 180 chum and 10 steelhead.

Table 25. Estimated catches of non-Fraser sockeye and pink salmon and of other salmon species in Panel Area net fisheries directed at Fraser sockeye and pink salmon in 2005.

Area and Gear	Non-Fraser Sockeye	Non-Fraser Pink	Fraser and Non-Fraser Chinook	Coho	Chum	Steelhead
United States *						
Areas 4B, 5 and 6C Net	70	1,100	100	600	60	10
Areas 6, 7 and 7A Net	0	21,800	4,300	900	120	0
Total	70	22,900	4,400	1,500	180	10
Canada **						
Area 20 Net **	1,020	0	0	0	0	0
Area 29 Net **	0	0	0	0	0	0
Total	1,020	0	0	0	0	0
Total	1,090	22,900	4,400	1,500	180	10

* Estimates are from the WDFW "soft-system".

** Estimates are from DFO in-season hail program.

VII. ALLOCATION STATUS

By Panel agreement, no paybacks were carried forward from 2004 (Table 26). Also, in accordance with Panel interpretation of the February 18, 2005 Commission Guidance, no paybacks were generated from catch overages or underages in 2005, so there are no paybacks to carry forward to future years for either sockeye or pink salmon.

Table 26. Allocation status of Fraser River sockeye and pink salmon for 1999-2005.

	Sockeye						
	1999	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
TOTAL ALLOWABLE CATCH							
Total Run Size	3,643,000	5,217,000	7,213,000	15,312,000	5,408,000	4,438,000	8,770,000
Escapement and other deductions	3,438,000	3,198,000	6,132,000	9,568,000	3,159,000	3,663,000	6,124,000
Total Allowable Catch:	205,000	2,019,000	1,081,000	5,744,000	2,249,000	775,000	2,646,000
UNITED STATES							
Washington Share *	46,000	412,000	241,000	496,000	371,000	128,000	437,000
Washington Catch	20,000	494,000	241,000	449,000	244,000	197,000	201,000
Balance:	26,000	-82,000	0	47,000	127,000	-69,000	236,000
Cumulative Allocation Status:	**26,000**	**-56,000**	**-56,000**	**-9,000**	**0 ****	**0 ****	**0 ****
CANADA							
Share + Aboriginal Exemption	390,000	1,952,000	1,197,000	n/a	2,278,000	1,047,000	2,610,000
Catch	416,000	1,870,000	1,197,000	3,508,000	1,918,000	2,013,000	1,143,000
Balance:	-26,000	82,000	0	n/a	360,000	-966,000	1,467,000

	Pink			
	1999	**2001**	**2003**	**2005**
TOTAL ALLOWABLE CATCH				
Total Run Size	3,616,000	21,293,000	26,000,000	10,000,000
Escapement and other deductions	3,468,000	19,881,000	7,843,000	6,010,000
Total Allowable Catch:	148,000	1,412,000	18,157,000	3,990,000
UNITED STATES				
Washington Share *	38,000	445,000	4,666,000	1,025,000
Washington Catch	17,000	445,000	811,000	338,000
Balance:	21,000	0	3,855,000	687,000
Cumulative Allocation Status:	**21,000**	**21,000**	**0 ****	**0 ****
CANADA				
Share	110,000	967,000	13,491,000	2,964,000
Catch	131,000	967,000	1,216,000	637,000
Balance:	-21,000	0	12,275,000	2,327,000

* Washington share of the TAC (excludes paybacks) according to Annex IV of the Pacific Salmon Treaty:

1999: Shall not exceed 22.4% for Fraser sockeye and 25.7% for Fraser pinks.

2000: Shall not exceed 20.4% for Fraser sockeye.

2001: Washington share equals Washington catch for Fraser sockeye and pink salmon, by agreement between the Parties on June 12, 2002.

2002: By a Feb. 12-13, 2003 Panel agreement, the Washington share equals the Washington catch plus the maximum payback (449,000 + 47,000 = 496,000). By agreement, no paybacks generated for 2003.

2003: Shall not exceed 16.5% for Fraser sockeye minus the payback, and 25.7% for Fraser pinks plus the payback. By agreement, no paybacks generated for 2004.

2004: Shall not exceed 16.5% for Fraser sockeye. By agreement, no paybacks generated for 2005.

2005: Shall not exceed 16.5% for Fraser sockeye and 25.7% for Fraser pinks. Panel interpretation of Feb. 18, 2005 Commission Guidance, item 1c(ii), was that no paybacks resulted from catch overages or underages in 2005 and so no paybacks generated for 2006.

** By Panel agreement, no paybacks are to be carried forward.

VIII. APPENDICES

APPENDIX A: Annex IV, Chapter 4 of the Pacific Salmon Treaty (revised February 17, 2005)

Chapter 4: Fraser River Sockeye and Pink Salmon

1. The provisions of this Chapter shall apply for the period 2005 through 2010.

2. The U.S. share of the annual Fraser River sockeye and pink salmon Total Allowable Catch (the "TAC"), as defined in paragraph 3 to be harvested in the waters of Washington State is as follows:

   (a) for sockeye salmon, the U.S. catch in the Fraser Panel Area shall not exceed 16.5 percent of the TAC;

   (b) for pink salmon, the U.S. catch in the Fraser Panel Area shall not exceed 25.7 percent of the TAC.

3. For the purpose of this Chapter, the TAC shall be defined as the remaining portion of the annual aggregate Fraser River sockeye and pink runs (including any catch of Fraser River sockeye identified in Alaskan waters) after the spawning escapement targets established, unless otherwise agreed, by application of Canada's pre-season escapement plan (subject to any adjustments made pursuant to paragraph 3(b), below), the agreed Fraser River Aboriginal Exemption, and the catch in Panel authorized test fisheries have been deducted. TAC shall be computed separately for Fraser River sockeye and pink salmon. The following definitions and procedures apply to TAC calculations:

   (a) The annual U.S. share shall be computed based on the inseason run size estimates in effect at the time the Panel relinquishes control of the U.S. Panel waters, using the escapement targets established by application of Canada's preseason escapement plan as may be adjusted pursuant to paragraph 3(b), below, and taking into account any adjustments as provided in paragraph 8, below.

   (b) For the purposes of in-season management by the Fraser River Panel, the spawning escapement objective is the target set by Canada, including any extra requirements that may be identified and agreed to by the Fraser River Panel, for natural, environmental, or stock assessment factors, to ensure the fish reach the spawning grounds at target levels. In the event the Fraser River Panel does not agree to additional escapement amounts, the PSC staff will make a recommendation which shall become effective upon agreement by at least one national section of the Panel. Any additional escapement amounts believed necessary by Canada above those determined pursuant to the foregoing will not affect the U.S. share.

   (c) The agreed Fraser River Aboriginal Fishery Exemption (AFE) is that number of sockeye which is subtracted from the total run size in determining the TAC upon which the U.S. shares specified in paragraph 2 are calculated. Any Canadian harvests in excess of these amounts count against the TAC, and do not affect the U.S. share. The agreed Fraser River Aboriginal Fishery Exemption is the actual catch of Fraser River sockeye harvested in both the in-river and marine area Aboriginal Fisheries, up to 400,000 sockeye annually.

   (d) For computing TAC by stock management groupings, the AFE shall be allocated to management groups as follows: The Early Stuart sockeye exemption shall be up to 20% of the Fraser River Aboriginal Fishery Exemption (AFE), and the remaining balance of the latter exemption shall be based on the average proportional distribution for the most recent three cycles and modified annually as required to

address concerns for Fraser River sockeye stocks and other species and as otherwise agreed by the Fraser River Panel. For the duration of this Chapter, the harvest distribution of Early Stuart sockeye is expected to remain similar to that of recent years.

(e) To the extent practicable, the Fraser River Panel shall manage the United States fishery to spread the United States harvest proportionately to the TACs across all Fraser River sockeye stock management groupings (Early Stuart, Early Summer, Mid-Summer, and Late Run).

4. Pursuant to Article IV, paragraph 3, Canada shall annually establish the Fraser River sockeye and pink salmon spawning escapement targets for the purpose of calculating the annual TAC. For the purposes of pre-season planning, where possible, Canada shall provide forecasts of run size and spawning escapement requirements by stock management groupings to the Fraser River Panel no later than the annual meeting of the Commission. Forecasts of migration patterns, gross escapement needs, and any in-season adjustments in escapement requirements shall be provided to the Fraser River Panel by Canada as they become available in order to accommodate the management needs of the Panel in a timely manner. In addition, on a timely basis, the United States shall provide forecasts of sockeye and pink salmon run size returns affected by Panel management.

5. The Fraser River Panel will develop fishing plans and in-season decision rules as may be necessary to implement the intent of this Chapter. The Parties shall establish and maintain data sharing principles and processes which ensure that the Parties, the Commission, and the Fraser River Panel are able to manage their fisheries in a timely manner consistent with this Chapter. With respect to management responsibilities, all activities of the Parties and the Fraser River Panel shall be consistent with the August 13, 1985, Memorandum of Understanding between the Parties.

6. Fraser River Panel pre-season planning meetings that do not occur simultaneously with Commission meetings shall be held alternately in Canada and the United States. Scheduled in-season management meetings shall be held at Richmond, B.C. unless the Panel agrees otherwise. As agreed, Panel meetings may be held by telephone conference call.

7. The Parties may agree to adjust the definition of the Fraser Panel Area as necessary to simplify domestic fishery management and ensure adequate consideration of the effect on other stocks and species harvested in the Area.

8. Annually, the U.S. share shall be adjusted for harvest overages and underages in accordance with guidance provided by the Commission.

9. The Parties shall establish a Technical Committee for the Fraser River Panel:

   (a) the members shall coordinate the technical aspects of Fraser River Panel activities with and between the Commission staff and the national sections of the Fraser River Panel, and shall report, unless otherwise agreed, to their respective National Sections of the Panel. The Committee may receive assignments of a technical nature from the Fraser River Panel and will report results directly to the Panel.

   (b) membership of the Technical Committee shall consist of up to five such technical representatives as may be designated by each National Section of the Commission.

   (c) members of the Technical Committee shall analyze proposed management regimes, provide technical assistance in the development of proposals for management plans, explain technical reports and provide information and technical advice to their respective National Sections of the Panel.

   (d) the Technical Committee shall work with the Commission staff during pre-season development of the fishery regime and management plan and during in-season consideration of regulatory options for the sockeye and pink salmon fisheries of

Fraser Panel Area waters and during post-season evaluations of the season to ensure that:

(i) domestic allocation objectives of both Parties are given full consideration;

(ii) conservation requirements and management objectives of the Parties for species and stocks other than Fraser River sockeye and pink salmon in the Fraser Panel Area during periods of Panel regulatory control are given full consideration; and

(iii) the Commission staff is informed in a timely manner of management actions being taken by the Parties in fisheries outside of the Fraser Panel Area that may harvest sockeye and pink salmon of Fraser River origin.

(e) the staff of the Commission shall consult regularly in-season with the Technical Committee to ensure that its members are fully informed in a timely manner on the status of Fraser River sockeye and pink salmon stocks, and the expectations of abundance, migration routes and proposed regulatory options, so the members of the Technical Committee can brief their respective National Sections prior to each in-season Panel meeting.

10. The Parties agree that Panel management actions should meet the following objectives, listed in order of priority:

(a) obtain spawning escapement goals by stock or stock grouping;

(b) meet Treaty defined international allocation; and

(c) achieve domestic objectives.

11. The Fraser River Panel shall manage its fisheries consistent with the provisions of the other chapters of Annex IV to ensure that the conservation needs and management requirements for other salmon species and other sockeye and pink salmon stocks are taken into account.

12. The Parties agree to develop regulations to give effect to the provisions of the preceding paragraphs. Upon approval of the pre-season plan and during the period of Panel regulatory control, all sockeye and pink fisheries under the Panel's jurisdiction are closed unless opened for fishing by in-season order of the Panel.

13. Pursuant to the Parties' obligations under Article VI the Panel will use the following in-season decision process:

(a) The mid-point forecast provided by Canada will be used for management purposes until in-season updates of run size become available. Based upon advice from the Fraser River Panel Technical Committee and PSC staff, the Panel may adopt a more precautionary or optimistic applications of the forecast information until in-season updates of run size are available. PSC staff will provide the Fraser River Panel with recommendations for in-season run size and other factors relevant to sound fisheries management decisions. Based on information such as, but not limited to, in-season estimates of run timing and diversion rate, the PSC staff will make recommendations to the Fraser River Panel regarding in-season decision making.

(b) PSC staff will provide the Fraser River Panel with projected harvestable surpluses and status of harvest from fisheries under Panel management. These projections will incorporate any Fraser River Panel agreement on management adjustments that deal with environmental conditions during in-river migration that could significantly impact the Fraser River Panel's ability to achieve spawning escapement objectives and other considerations agreed to by the Panel.

(c) Any changes from PSC staff recommendations for points 13(a) and 13(b) above shall be based on bilateral agreement between the National Sections of the Fraser Panel. Acceptance of the PSC staff recommendation requires approval of at least one of the National Sections.

(d) The respective National Sections of the Panel will develop proposed regulations for their domestic Panel Water fisheries consistent with recommendations and projections provided by the PSC staff as described in 13(a) and 13(b) as may be modified pursuant to 13(c). Either National Section may ask PSC staff for advice in designing its fisheries proposals. PSC staff will assess and provide advice as to whether proposed fishery regulations for Panel Water fisheries are consistent with recommendations and projections described in 13(a) and 13(b) and Panel objectives. Subsequently, after full discussion of a Panel water fishery proposal, the following may occur: (i) the Panel may adopt the proposal based on bilateral agreement or; (ii) the proposing National Section may modify and re-submit its proposal in response to advice from staff and/or concern(s) raised by the other National Section; or (iii) while acknowledging objection(s) of the other National Section, the Panel will grant the request to adopt the fishery proposal . In the event that the Panel adopts a fishery under the provisions of the latter circumstance (13(d)(iii)), prior to the commencement of the proposed fishery, the proposing National Section must provide a written rationale for the fishery as submitted.

(e) If post-season a party maintains that it has been adversely affected by a fishery they objected to pursuant to paragraph 13(d)(iii) above or paragraph 13 (f) below; the PSC staff will prepare an objective report on the circumstances of the fishery and its consequences for the January PSC meeting following the season in question. The Panel will review the staff report and determine what action is required. If the Panel cannot come to agreement on the appropriate action, the issue will be referred to the Commission for resolution during its February annual meeting.

(f) Pursuant with Article VI, paragraph 7 of the treaty, the Parties will communicate and consult with one another in a timely manner regarding their fishing plans for Fraser River sockeye outside of the Panel's regulatory control. In the event that a party has an objection to the other party's fishing plans as they relate to achievement of Panel objective, the implementing party will provide the rational for such plans.

APPENDIX B: COMMISSION GUIDANCE TO THE FRASER RIVER PANEL AND PSC STAFF FOR 2005

February 18, 2005

Commission Guidance to the Fraser River Panel

The purpose of this document is to provide Commission direction to the Fraser River Panel with respect to implementation of Paragraph 8 of Chapter 4, Annex IV of the Pacific Salmon Treaty.

1. Annually, the U.S. share shall be adjusted for harvest overages and underages as follows:

   (a) The U.S. share shall be adjusted in the amount of any harvest overage or underage of the same species from the previous year or years as provided in subparagraphs 1(b) and 1(c), below. In making such adjustment, the U.S. current year share will not be reduced by more than 5 percent nor increased by more than 15 percent because of the adjustment, unless otherwise agreed. The Fraser River Panel shall attempt to fully implement any adjustments to the U.S. share by the expiration of this Chapter. Any remaining balance from the harvest overage or underage shall be incorporated in the subsequent year's allocation. Any residual overage or underage remaining at the last year of this Chapter shall be carried forward into the next Chapter period.

   (b) The U.S. share will be adjusted to account for management imprecision in U.S. fisheries or changes in the TAC which are identified inseason but too late to address in that year's fishery subject to the underage limitation prescribed in subparagraph 1(c). Additionally, the U.S. share will be adjusted for underages which occur as a result of Canada directly impeding the U.S. from pursuing its in-season share of the TAC. This latter circumstance will be noted in-season by the Panel including the effect Canada's catch had on impeding the U.S. pursuit of its in-season share, and will be compensated for as an underage pursuant to paragraph 1(a).

   (c) The U.S. share will not be adjusted:

      (i) for underages which occur because the U.S. fishery failed to deploy sufficient effort;

      (ii) for underages which occur because too few fish were available to the U.S. fishery due to migration patterns (e.g., diversion rates) or harvesting constraints for intermingled stocks or species; or

      (iii) for that portion of an underage resulting from an increase in the estimated TAC identified after the year's fishery has ended but which would not have been available due to harvest constraints for intermingled stocks or species.

2. The Fraser River Panel shall develop agreed procedures for implementing this guidance as part of its preseason planning process.

APPENDIX C: 2005 PRE-SEASON FORECASTS AND SPAWNING ESCAPEMENT TARGETS FOR FRASER RIVER SOCKEYE AND PINK SALMON

Table 1. Pre-season forecasts for Fraser River sockeye and pink salmon. (Provided to the Panel by Fisheries and Oceans Canada).

Sockeye stock/timing group	Forecast model	Mean[c] Run Size[b]		Probability of Achieving Specified Run Sizes[a]				
		all cycles	2005 cycle	0.25	0.5	0.75	0.8	0.9
Early Stuart	Fry	**348,000**	**893,000**	**383,000**	**258,000**	**175,000**	**158,000**	**120,000**
Early Summer		**489,000**	**316,000**	**1,301,000**	**718,000**	**391,000**	**338,000**	**224,000**
Fennell	Ricker	28,000	18,000	74,000	40,000	22,000	19,000	13,000
Bowron	Power	23,000	14,000	44,000	28,000	18,000	16,000	12,000
Raft	Power	25,000	20,000	182,000	106,000	62,000	54,000	38,000
Gates	R/S	68,000	51,000	103,000	57,000	31,000	27,000	18,000
Nadina	Fry	75,000	76,000	194,000	106,000	58,000	50,000	33,000
Pitt	Power	57,000	81,000	152,000	88,000	51,000	45,000	31,000
Seymour	Cmean	156,000	27,000	37,000	20,000	11,000	9,000	6,000
Scotch	Power	57,000	29,000	28,000	12,000	5,000	4,000	2,000
Misc[c]	R/S	-	-	487,000	261,000	133,000	114,000	71,000
Summer		**5,800,000**	**11,873,000**	**15,658,000**	**11,048,000**	**7,834,000**	**7,196,000**	**5,747,000**
Chilko	Pooled	1,887,000	1,520,000	2,870,000	2,087,000	1,518,000	1,402,000	1,135,000
Quesnel	Ricker	2,536,000	7,402,000	9,510,000	6,948,000	5,076,000	4,694,000	3,813,000
Stellako	Ricker	532,000	343,000	843,000	562,000	375,000	339,000	259,000
Late Stuart	Cmean	845,000	2,608,000	2,435,000	1,451,000	865,000	761,000	540,000
Late		**3,378,000**	**1,070,000**	**974,000**	**524,000**	**279,000**	**239,000**	**156,000**
Birkenhead	Power	522,000	527,000	375,000	209,000	117,000	101,000	69,000
Late Shuswap	Ricker	2,316,000	92,000	33,000	18,000	9,000	8,000	5,000
Cultus	Power	21,000	4,000	<500	<500	<500	<500	<500
Portage	Power	63,000	87,000	47,000	23,000	11,000	9,000	6,000
Weaver	R/S	456,000	360,000	207,000	108,000	57,000	48,000	31,000
Misc Shuswap[d]	R/S	-	-	14,000	7,000	4,000	3,000	2,000
Misc. non-Shuswap[d]	R/S	-	-	298,000	159,000	81,000	70,000	43,000
TOTAL		**10,015,000**	**14,152,000**	**18,316,000**	**12,548,000**	**8,679,000**	**7,931,000**	**6,247,000**
Pink	Fry, Salinity		**11,520,000**	**22,761,000**	**16,318,000**	**11,698,000**	**10,734,000**	**8,450,000**

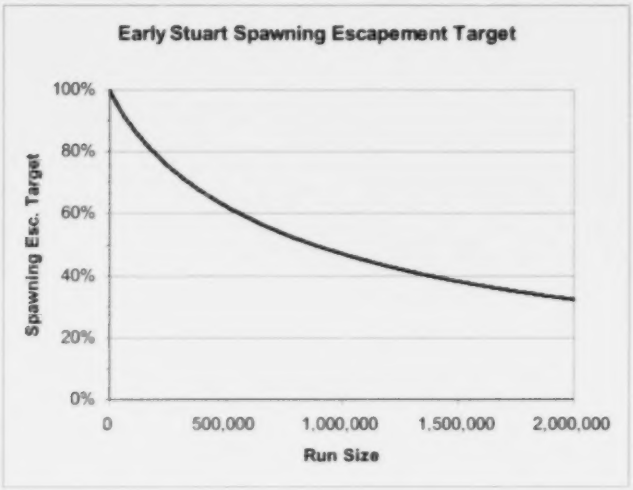
True lates	**472,000**	**247,000**	**128,000**
Birkenhead & Big Silver	**502,000**	**277,000**	**151,000**

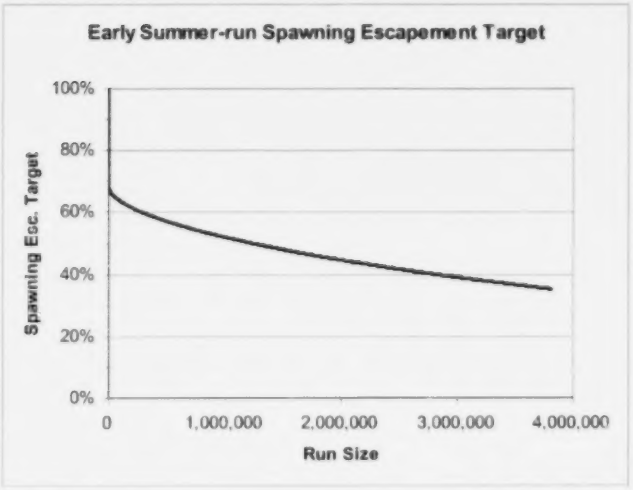
[a] probability that the actual run size will exceed the specified projection
[b] 1980-2002 mean
[c] unforecasted miscellaneous Early Summer stocks
[d] unforecasted miscellaneous Late stocks

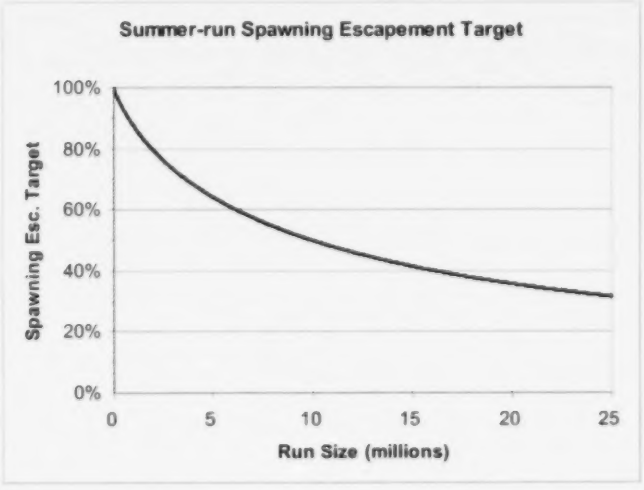
3/1 Forecast Issue

Shuswap non 3/1	total with 57%3/1	potential '3/1's
25000	58,140	33,140
Harrison 4/1	total with 80%4/1	3/1
49,874	62,343	12,469
Total true late 3/1 not in forecast		45,608

Figures 1-3. Fraser River sockeye and pink salmon spawning escapement target plan for 2005. The plans for Early Stuart, Early Summer and Summer runs were represented by curves provided by Canada (see below), while for Late-run sockeye the target was 85% of the total return (based on a maximum exploitation rate of 15%) and for Fraser pinks was a fixed escapement target of 6,000,000 fish.







APPENDIX D: 2005 FRASER RIVER PANEL MANAGEMENT PLAN PRINCIPLES AND CONSTRAINTS

1. Fisheries and Oceans Canada (DFO) have provided the Panel with run-size forecasts for Fraser River Pink salmon and Fraser River sockeye salmon by run timing group. For pre-season planning purposes, the Panel used the 50% probability (p) levels of abundance for each species. There is a 50% probability that the Fraser sockeye salmon return will reach or exceed 12,548,000 fish. There is a 50% probability the Fraser pink salmon return will reach or exceed 16,318,000 fish.

2. The Panel's first priority for 2005 is to achieve Late-run sockeye[2] objectives as indicated in the document, "Guidelines for Pre-season Fraser Sockeye Fishing Plans to Address Late-Run Concerns".

3. The Panel has adopted a management approach for Late-run sockeye that presumes, that similar to recent years, Late-run sockeye will enter the Fraser River early and a significant proportion will not survive to spawn.

4. TAC and international shares will be calculated according to the February 18, 2005 Commission Guidelines and the 2005 revised Annex IV, Chapter 4, of the Pacific Salmon Treaty, which limits the United States harvest (in Washington State) to 16.5% of the total allowable catch (TAC) of Fraser River sockeye salmon, while the Canadian share of the TAC is 83.5%. Based upon the 50% probability (p) levels of abundance, for the purposes of computing TAC by stock management grouping in 2005, the Panel agreed to a Fraser River Aboriginal Exemption for Early Summer sockeye of 22,900, Summer-run sockeye of 369,800, Birkenhead sockeye of 3,700, and Late-run sockeye of 3,600. With respect to Fraser River pink salmon, under the terms of Annex IV, Chapter 4, of the Pacific Salmon Treaty, the United States share of the TAC is 25.7%, while the Canadian share is 74.3%. As per Fraser Panel agreement, for the 2005 season there are no catch overages of Fraser River sockeye or pink salmon from prior years.

5. The Panel has adopted 50% probability level forecasts for Early Stuart, Early Summer, Summer and Late-run sockeye, and for Fraser River pink salmon, for planning fisheries. When sufficient information is available in-season, the Panel will update the run size estimate of Fraser River sockeye and pink salmon stocks, as appropriate.

Regulations

1. If the abundance of Early Summer-run sockeye salmon is tracking at approximately the 50% probability level (718,000 fish) and the abundance of Summer-run sockeye salmon is tracking at approximately the 50% probability level (11,048,000 fish) and the runs arrive at near normal dates, fisheries would be expected to commence the week of July 24 – 30 in United States and Canadian Panel Waters. If the return abundances of Early Summer and Summer-run sockeye vary from the 50% probability level forecast, this could change the commencement of, or the duration of fisheries.

2. Fisheries directed at Fraser River pink salmon will be managed in accordance with the Late-run sockeye guidelines.

3. The Parties' conservation concerns for other species and stocks will be taken into account throughout the 2005 management season.

[2] Late-run here refers to the Late-run timing group, excluding Birkenhead and a few minor miscellaneous sockeye stocks.

APPENDIX E: GUIDELINES FOR PRE-SEASON FRASER SOCKEYE FISHING PLANS TO ADDRESS LATE-RUN CONCERNS

The 2005 cycle is the second off-line cycle for Adams River sockeye, and Late-run sockeye have historically experienced small returns on this cycle line relative to Summer-run sockeye, with the Weaver Creek stock group the predominant Late-run stock. All Late-run stocks were impacted severely by early upstream migration and mortality in the brood year (2001). As a consequence, the total forecast for late-run sockeye in 2005 (247,000 fish at the 50% p level) is approximately 50% of the average for the cycle (1973 – 2001). In addition, there is special concern for Cultus sockeye for which recovery plans are being developed by Canada to ensure this stock's long-term viability. A co-ordinated approach to management will be developed that reflects both Parties sharing the burden of conservation of Late-run sockeye. Additional measures to reduce the fishing impact on Cultus sockeye will be taken by Canada in 2005.

ASSUMPTIONS

1. For fisheries planning purposes, it was assumed that Late-run sockeye will continue their post-1995 early upstream migration behaviour. A 50% upstream migration of August 24 was adopted based on historical Late-run marine timing on this cycle, and on Late-run upstream migration behaviour in recent years. In addition, an en route mortality of 81% was assumed, as derived from the Management Adjustment model.

2. There is good capability to assess key parameters in-season, such as run size, migration timing, etc. for Summer-run sockeye, however, it is unlikely that Summer-run run size updates will be generated during the period of active Panel Area management for this stock group. There will be limited capacity to assess these parameters for Late-run sockeye (until the migration nears its' completion) because of their low abundance relative to Summer-run sockeye. In addition, the PSC staff will be unable to advise the Panel on the in-river migration timing and associated en route mortality of Late-run sockeye during the period when Panel Area fishery openings are being contemplated.

3. In-season assessment limitations with respect to monitoring the run strength and migration timing of Late-run stocks in 2005 necessitate an approach to management based on pre-season planning. The intent will be to optimize fishing opportunities to harvest surplus Early Summer and Summer-run stocks, while coincidentally restricting the harvest of Late-run stocks.

4. The pre-season fishing plan will assume a 6 day separation in the 50% marine migration timing between Summer-run (August 8) and Late-run sockeye (August 14).

ELEMENTS OF THE PLAN

- Based upon pre-season information and assumptions, fishery impacts on Late-run sockeye will be limited to 15% of the total return, and the United States limit will be 2.2% Late-run exploitation rate. Based upon the 50% probability (p) levels of abundance, for the purposes of computing TAC by stock management grouping in 2005, the Panel agreed to a Fraser River Aboriginal Exemption for Early Summer sockeye of 22,900, Summer-run sockeye of 369,800, Birkenhead sockeye of 3,700, and Late-run sockeye of 3,600. There is no available harvest of Early Stuart sockeye at the 50% probability level forecast.

- In order to ensure that Late-run conservation objectives are met and as a consequence of the limited assessment capability for Late-run sockeye in 2005, the in-season decisions regarding fisheries directed at Summer-run sockeye will be based largely on the magnitude of the Late-run impacts relative to the objective. Late-run catches will be assessed using DNA stock identification methodology.

- Fisheries directed at Fraser River pink salmon will take into account Late-run sockeye concerns.

APPENDIX F: 2005 FRASER PANEL MANAGEMENT PROCESS

(Agreed to July 29, 2005)

Executive Summary

1. The 2005 management plan is similar in structure to recent past years, with fishing opportunities constrained by Early Summer-runs early in the management season, and by conservation concerns for Late-run stocks later in the season.
2. Start-up of fisheries is expected to occur in a similar manner to recent past years, through an evaluation of relative stock proportions, as well as escapement past Mission and cumulative migration abundance in marine assessment areas of Early Summer and Summer-run stocks.
3. Late-runs sockeye are forecast to comprise only 2% of the Fraser River sockeye return in 2005. This will make it extremely unlikely that updates of Late-run timing and abundance will be available during the period of active in-season sockeye management. However, simulation studies show that it will be possible to estimate Late-run impacts directly in mixed stock fisheries using DNA. This will enable the Panel to assess the measured catch and escapement of Late-run stocks relative to expected levels based on pre-season assumptions of run timing and abundance.
4. The fraction of the total late-run sockeye run entering marine waters increases significantly beginning the first week of August. Therefore, fisheries during this period will need to be structured with consideration of the primary Panel objective for 2005 (the Late-run exploitation rate limit of 15%), while balancing the competing objective of maximizing the Summer-run catch.
5. In-season modifications to abundance and timing will be limited since the critical fishery decisions are expected to occur prior to the peak of the Summer and Late-run stocks in marine assessment areas. However, weak relationships exist between the timing of Early Stuart and Early Summer-run stocks and the timing of later-timed stocks. The staff and FRPTC might use these timing relationships informally to help the Panel assess the risks of alternative fishery options during the 2005 management season. However, these data could not be used without increasing the uncertainty in projecting Late-run harvest impacts.
6. The pre-season forecast is for an 80% diversion rate through Johnstone Strait. The pre-season fishing plan incorporates a relatively intensive fishing pattern in United States Panel Area waters in response to the low abundance of fish projected to be migrating through Juan de Fuca Strait. If the diversion rate is lower than forecast, the fishing effort in United States waters will likely be reduced relative to that modeled in the pre-season plan. Conversely, a moderate diversion rate in 2005 may result in additional fishing opportunities for Canadian fishers in Johnstone Strait, relative to those modeled in the pre-season plan. This highlights the importance of tracking diversion rate shifts during the 2005 management season, in addition to the standard suite of in-season assessment variables (timing, abundance, etc.) that are evaluated each season.
7. The Panel has agreed to use a catch limit approach to evaluate Late-run impacts during the 2005 management season. The underlying assumption of this approach is that the relationship between effort and harvest rate is not constant, and assuming run size is known, if Late-run catches deviate from expectations it reflects a change in the harvest rate from the estimate in the pre-season planning model. Under this approach lower late-run catches could be interpreted as reflecting lower exploitation rates. As a consequence, increased effort could be considered (fisheries extended) if Late-run catches are lower than those modeled, and could be curtailed if Late-run catches exceeded expectations. Deviations in Late-run catches from modeled expectations could also be due to differences between pre-season assumptions and in-season values of Late-run stocks timing and abundance. These assumptions on Late-run timing and abundance will be reviewed in-season prior to making any adjustments to the pre-season fishing plan. A cautious approach will be taken when considering if any additional fisheries from the pre-season planning model are warranted. The Panel has agreed to use DNA based stock identification techniques to estimate late run stock proportions and apply those estimates to catches to track Late-run impacts relative to the objectives.
8. Fisheries directed at Pink salmon will be managed in accordance with the Late-run sockeye guidelines.

APPENDIX G: 2005 REGULATIONS

The Fraser River Panel approved regulations for the management of the Fraser River sockeye and pink salmon fishery in Panel Area waters and submitted these to the Pacific Salmon Commission. The Commission approved the Fishery Regime and Regulations and submitted these to the respective national governments for approval on June 24, 2005.

Canadian Fraser River Panel Area

In accordance with Article VI, Paragraph 5 of the Pacific Salmon Treaty, the Commission recommends to the Canadian Government the adoption of the following Fishing Regime developed by the Fraser River Panel, namely:

1. a) No person shall commercially fish for sockeye or pink salmon in Pacific Fishery Management Area 20-1, 3 and 4 with nets from the 26th day of June, 2005, to the 17th day of September, 2005, both dates inclusive.

   b) No person shall troll commercially for sockeye or pink salmon in Pacific Fishery Management Area 20-1, 3 and 4 from the 26th day of June, 2005, to the 17th day of September, 2005, both dates inclusive.

2. a) No person shall commercially fish for sockeye or pink salmon in Pacific Fishery Management Areas 17 and 18 with nets from the 26th day of June, 2005, to the 1st day of October, 2005, both dates inclusive.

   b) No person shall troll commercially for sockeye or pink salmon in Pacific Fishery Management Area 18-1, 4 and 11 from the 26th day of June, 2005, to the 1st day of October, 2005, both dates inclusive.

3. a) No person shall commercially fish for sockeye or pink salmon with nets in Pacific Fishery Management Area 29 from the 26th day of June, 2005, to the 15th day of October, 2005, both dates inclusive.

   b) No person shall troll commercially for sockeye or pink salmon in Pacific Fishery Management Area 29 from the 26th day of June, 2005, to the 15th day of October, 2005, both dates inclusive.

4. The following Fraser River Panel Area waters are excluded:

   a) High Seas westerly of the Bonilla Point-Tatoosh Island Lighthouse Line.

   b) Pacific Fishery Management Area 19, Area 20-2 and 5 to 7 and Area 29-8.

   c) Commercial troll fishing in Pacific Fishery Management Area 17, Area 18-2, 3 and 5 to 10.

During the 2005 season, the Fraser River Panel will adopt Orders establishing open fishing periods based on a 2005 Management Plan adopted by the Panel. This Plan will be designed to achieve Pacific Salmon Treaty-mandated conservation objectives, international allocations of the catch, and domestic goals of the Parties.

United States Fraser River Panel Area

In accordance with Article VI, Paragraph 5 of the Pacific Salmon Treaty, the Commission recommends to the United States Government the adoption of the following Fishing Regime developed by the Fraser River Panel, namely:

Treaty Indian Fisheries:

1. No Treaty Indian shall commercially fish for sockeye or pink salmon in Puget Sound Salmon Management and Catch Reporting Areas 4B, 5 and 6C with drift gillnets or purse seines from the 26th day of June, 2005 to the 17th day of September, 2005, both dates inclusive.

2. No Treaty Indian shall commercially fish for sockeye or pink salmon in Puget Sound Salmon Management and Catch Reporting Areas 6, 6A, 7 and 7A with nets from the 26th day of June, 2005, to the 1st day of October, 2005, both dates inclusive.

3. No Treaty Indian shall commercially fish for sockeye or pink salmon with nets in that portion of Puget Sound Salmon Management and Catch Reporting Area 7A lying westerly of a straight line drawn from the low water range marker in Boundary Bay on the International Boundary through the east tip of Point Roberts in the State of Washington to the East Point Light on Saturna Island in the Province of British Columbia from the 2nd day of October, 2005, to the 8th day of October, 2005, both dates inclusive.

All-Citizen Fisheries:

1. No person shall fish for sockeye or pink salmon in Puget Sound Salmon Management and Catch Reporting Areas 4B, 5, and 6C with nets from the 26th day of June, 2005, to the 17th day of September, 2005, both dates inclusive.

2. No person shall fish for sockeye or pink salmon in Puget Sound Salmon Management and Catch Reporting Areas 6, 6A, 7 and 7A with nets from the 26th day of June, 2005, to the 1st day of October, 2005, both dates inclusive.

3. No person shall fish for sockeye or pink salmon with nets in that portion of Puget Sound Salmon Management and Catch Reporting Area 7A lying westerly of a straight line drawn from the low water range marker in Boundary Bay on the International Boundary through the east tip of Point Roberts in the State of Washington to the East Point Light on Saturna Island in the Province of British Columbia from the 2nd day of October, 2005, to the 8th day of October, 2005, both dates inclusive.

The following Fraser River Panel Area waters and fisheries are excluded:

Treaty Indian and All-Citizen Fisheries:

1. High Seas westerly of the Bonilla Point-Tatoosh Island Lighthouse Line.

2. Puget Sound Salmon Management and Catch Reporting Areas 6B, 6D, 7B, 7C, 7D and 7E.

During the 2005 season, the Fraser River Panel will adopt Orders establishing open fishing periods based on a 2005 Management Plan adopted by the Panel. This Plan will be designed to achieve Pacific Salmon Treaty-mandated conservation objectives, international allocations of the catch, and domestic goals of the Parties.

APPENDIX H: 2005 FRASER RIVER PANEL IN-SEASON ORDERS

To provide for adequate escapement of the various stocks of Fraser River sockeye and pink salmon and for the prescribed allocation of catch: (a) internationally, between the United States and Canada and (b) domestically, among the commercial user groups in Canada and the United States, the Fraser River Panel formulated the following orders to regulate Panel Area fisheries in 2005.

July 29, 2005
United States
Treaty Indian Fishery
Areas 4B, 5 and 6C
Open to drift gillnets 12:00 p.m. (noon), Monday, August 1, 2005, to 12:00 p.m. (noon) Wednesday, August 3, 2005.

August 2, 2005
United States
Treaty Indian Fishery
Areas 4B, 5 and 6C
Extended for drift gillnets from 12:00 p.m. (noon), Wednesday, August 3, 2005, to 12:00 p.m. (noon) Saturday, August 6, 2005.

August 5, 2005
United States
Treaty Indian Fishery
Areas 4B, 5 and 6C
Extended for drift gillnets from 12:00 p.m. (noon), Saturday, August 6, 2005, to 12:00 p.m. (noon) Monday, August 8, 2005.

August 7, 2005
United States
Treaty Indian Fishery
Areas 4B, 5 and 6C
Extended for drift gillnets from 12:00 p.m. (noon), Monday, August 8, 2005, to 12:00 p.m. (noon) Wednesday, August 10, 2005.

August 9, 2005
United States
Treaty Indian Fishery
Areas 4B, 5 and 6C
Extended for drift gillnets from 12:00 p.m. (noon), Wednesday, August 10, 2005, to 12:00 p.m. (noon) Saturday, August 13, 2005.

August 12, 2005
United States
Treaty Indian Fishery
Areas 4B, 5 and 6C
Extended for drift gillnets from 12:00 p.m. (noon), Saturday, August 13, 2005, to 12:00 p.m. (noon) Wednesday, August 17, 2005.

August 19, 2005
United States
Treaty Indian Fishery
Areas 4B, 5 and 6C
Open to drift gillnets 12:00 p.m. (noon), Saturday, August 20, 2005 to 12:00 p.m. (noon) Tuesday, August 23, 2005.

August 22, 2005

United States

Treaty Indian Fishery

Areas 4B, 5 and 6C

Extended for drift gillnets from 12:00 p.m. (noon), Tuesday, August 23, 2005, to 12:00 p.m. (noon) Saturday, August 27, 2005.

Areas 6, 7, and 7A

Open to net fishing from 5:00 a.m., Friday, August 26, 2005 to 8:00 a.m., Saturday, August 27, 2005.

All Citizen Fishery

Areas 7 and 7A

Open to gillnets from 3:00 p.m. to 7:00 p.m., Thursday, August 25, 2005.

Areas 7 and 7A

Open to reef nets from 6:00 a.m. to 2:00 p.m., Thursday, August 25, 2005.

August 26, 2005

United States

Treaty Indian Fishery

Areas 4B, 5 and 6C

Extended for drift gillnets from 12:00 p.m. (noon), Saturday, August 27, 2005, to 12:00 p.m. (noon) Tuesday, August 30, 2005.

Areas 6, 7, and 7A

Extended for net fishing from 8:00 a.m., Saturday, August 27, 2005 to 9:00 p.m., Sunday, August 28, 2005

All Citizen Fishery

Areas 7 and 7A

Open to gillnets from 2:00 p.m. to 8:00 p.m., Monday, August 29, 2005.

Areas 7 and 7A

Open to reef nets from 12:00 p.m. (noon) to 6:00 p.m., Monday, August 29, 2005.

Areas 7 and 7A

Open to purse seines from 8:00 a.m. to 6:00 p.m., Monday, August 29, 2005.

September 2, 2005

United States

Treaty Indian Fishery

Areas 4B, 5 and 6C

Open to drift gillnets 4:00 a.m., Saturday, September 3, 2005 to 12:00 p.m. (noon) Wednesday, September 7, 2005.

Areas 6, 7, and 7A

Open to net fishing from 4:00 a.m., Saturday, September 3 to 9 p.m. Monday, September 5, 2005, in the area southerly and easterly of a straight line drawn from Iwersen's dock on Point Roberts in the State of Washington to the Georgina Point Light at the entrance to Active Pass in the Province of British Columbia.

All Citizen Fishery

Areas 7 and 7A

Open to purse seines from 5:00 a.m. to 9:00 p.m., Tuesday, September 6, 2005, in the area southerly and easterly of a straight line drawn from Iwersen's dock on Point Roberts in the State of Washington to the Georgina Point Light at the entrance to Active Pass in the Province of British Columbia.

Areas 7 and 7A

Open to gillnets from 8:00 a.m. to 11:59 p.m. (midnight)., Tuesday, September 6, 2005, in the area southerly and easterly of a straight line drawn from Iwersen's dock on Point Roberts in the State of Washington to the Georgina Point Light at the entrance to Active Pass in the Province of British Columbia.

September 6, 2005

United States

All Citizen Fishery

Areas 7 and 7A

Open to gillnets from 8:00 a.m. to 11:59 p.m.(midnight), Wednesday, September 7, 2005, and from 8:00 a.m. to 11:59 p.m., Friday, September 9, 2005.

Areas 7 and 7A

Open to purse seines from 5:00 a.m. to 9:00 p.m., Wednesday, September 7, 2005, and from 5:00 a.m. to 9:00 p.m., Friday, September 9, 2005.

Areas 7 and 7A

Open to reef nets from 5:00 a.m. to 9:00 p.m., Wednesday, September 7, 2005, and from 5:00 a.m. to 9:00 p.m., Friday, September 9, 2005.

September 9, 2005

Canada

Canada is considering an opening in Area 18-1,4, and 11 for Area H troll, commencing as early as 12:01 a.m., Monday, September 12, 2005. Please refer to the DFO website or to their recorded message at 604-666-2828 for further details.

United States

Treaty Indian Fishery

Areas 4B, 5 and 6C

Open to drift gillnets 5:00 a.m., Saturday, September 10, 2005 to 9:00 p.m. Monday, September 12, 2005.

Areas 6, 7, and 7A

Open to net fishing from 5:00 a.m., Saturday, September 10 to 9:00 p.m. Monday, September 12, 2005.

All Citizen Fishery

Areas 7 and 7A

Open to gillnets from 8:00 a.m. to 11:59 p.m. (midnight), Tuesday, September 13, 2005, and from 8:00 a.m. to 11:59 p.m. (midnight), Wednesday, September 14, 2005.

Areas 7 and 7A

Open to purse seines from 5:00 a.m. to 9:00 p.m., Tuesday, September 13, 2005, and from 5:00 a.m. to 9:00 p.m., Wednesday, September 14, 2005.

Areas 7 and 7A

Open to reef nets from 5:00 a.m. to 9:00 p.m., Tuesday, September 13, 2005, and from 5:00 a.m. to 9:00 p.m., Wednesday, September 14, 2005.

September 12, 2005

Canada

Area 18-1, 18-4, and 18-11 (As previously announced by Canada (see DFO Fishery Notice: FN0679))

Open to Area H troll 12:01 a.m., Monday, September 12, 2005, until further notice.

United States

Areas 4B, 5, and 6C

Relinquish regulatory control effective 12:01 a.m., Tuesday, September 13, 2005.

September 16, 2005

United States

Areas 6, 6A, 7, and 7A (excluding that portion of Puget Sound Salmon Management and Catch Reporting Area 7A lying westerly of a straight line drawn from the low water range marker in Boundary Bay on the International Boundary through the east tip of Point Roberts in the State of Washington to the East Point Light on Saturna Island in the Province of British Columbia)

Relinquish regulatory control effective 12:01 a.m., Saturday, September 17, 2005.

APPENDIX I: PSC STOCK MONITORING AND IDENTIFICATION PROGRAMS

Stock Monitoring

The goal of the stock monitoring program is to assess run size, daily abundance, and migration timing of Fraser River sockeye and pink salmon at different points along their migration route. This information is required for the development of fishing plans that aid in meeting escapement and catch allocation objectives. Commercial catches have historically provided much of the data used in the analyses, however, limited commercial fishing in recent years has reduced the availability of this information. Test fisheries conducted by the Commission or by DFO (at the Commission's request) provide important data before and after the commercial fishing season and between fishing periods. Information about upstream migration in the Fraser River is primarily obtained by the hydroacoustic program at Mission, B.C., visual observations at Hells Gate and analysis of catches in Fraser River First Nations fisheries. Furthermore, diversion rate via Johnstone Strait is assessed weekly during the in-season period.

The upstream passage of sockeye and pink salmon in 2005 was monitored using Whonnock (Area 29-16) test fishing data from June 22 to September 28, and using the hydroacoustic program at Mission from June 26 to September 25. Between July 10 and September 2, estimates of Mission escapements of sockeye and pink salmon were derived by applying species composition data collected from gillnet test fishing at Whonnock to hydroacoustic estimates collected at Mission. Prior to July 10 and after September 2, upstream passage was monitored solely using Whonnock test fishing data. In addition, the PSC and DFO jointly conducted the eighth year of an experimental split-beam hydroacoustic program.

Daily observations at Hells Gate between July 2 and October 4 provided qualitative information on the success of upstream fish passage and abundance. The observations also provided a rough index for projecting the relative abundance of sockeye and pink salmon migrating through Hells Gate.

A. Sockeye Salmon

Run-size estimation of Fraser River sockeye by stock group is primarily based on catch, effort, escapement, stock composition and diversion rate data. These data are analysed using purse seine catch, catch per unit effort (CPUE), cumulative-normal, cumulative-passage-to-date and Bayesian models, most of which are described in the Pacific Salmon Commission's Technical Report No. 6 [3] and in the Fraser River Panel's 1995 Annual Report [4]. Much of the data used in these models are obtained from commercial fisheries, however, commercial fishing in 2005 was very restricted. Test fishing catch and CPUE data were therefore used extensively in assessing abundance by stock group.

B. Pink Salmon

Assessments of Fraser River pink salmon in marine areas in 2005 were based primarily on data from purse seine test fisheries due to the shortage of commercial data. Escapements to the Strait of Georgia were estimated by expansion of CPUE data from purse seine test fisheries. The proportion of Fraser River pink salmon in these catches was initially estimated using pre-season projections of stock composition. These estimates were later replaced in-season by genetic stock identification (GSI) estimates.

The pattern of daily pink salmon escapements in the Fraser River was assessed through hydroacoustic estimates of abundance. This was the first year of research on using new technologies (Split Beam and DIDSON technologies) to hydroacoustically assess the abundance of Fraser River Pink salmon. Challenges in the assessment of species composition remain

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[3] Pacific Salmon Commission. 1995. Pacific Salmon Commission run-size estimation procedures: An analysis of the 1994 shortfall in escapement of Late-run Fraser River sockeye salmon. Pacific Salmon Comm. Tech. Rep. No. 6: 179 p.

[4] Pacific Salmon Commission. 1998. Report of the Fraser River Panel to the Pacific Salmon Commission on the 1995 Fraser River sockeye and pink salmon fishing season. Vancouver, B.C., 64 p.

(Appendix J), however, assessments of the general pattern of pink salmon migration are considered reliable. Post-season assessment of pink salmon passage indicates the median timing at Mission was September 5.

C. Split-Beam Hydroacoustic Study at Mission

After the 2004 management season, several aspects of the split-beam hydroacoustic program were identified as requiring further research in order to provide more accurate estimates of daily salmon passage at Mission for the 2005 season. The main goal of the Mission hydroacoustic program is to produce accurate and timely estimates of total daily salmon migration past Mission for in-season management use. A second goal of the field program in 2005 was to conduct acoustic measurements of fish passage near the north bank, in response to a recommendation from the 2004 Southern Salmon Fishery Post-Season Review. A third goal of the program was to use a dual-frequency identification sonar system (DIDSON) at the Mission site to measure fish behaviour and abundance, and to compare these observations with those from the split-beam system. A feasibility study using DIDSON to enumerate fish passage at a site near Boston Bar, which is upstream of Hells Gate, was also conducted in 2005. The findings from the DIDSON experiments completed the study requirements under the 2004 DIDSON proposal to the Southern Boundary Restoration and Enhancement Fund. Some of the main results from the hydroacoustic studies in 2005 are:

1. A multivariate pattern recognition method was developed for the split-beam data to automate the target-recognition process. This method substantially reduced manual cleaning and improved the consistency of target recognition.

2. The split-beam estimation system produced near real-time daily estimates of salmon passage for in-season management use.

3. A side-looking, split-beam system was installed and operated on the north bank in late August. Data collected from this system helped in quantitative assessments of biases in fish passage estimates near the north bank.

4. The DIDSON imaging sonar was successfully deployed at various locations to image fish behaviour and passage. Valuable information was obtained from the image data, such as revealing behavioural responses of fish to the mobile survey vessel and the unique swimming pattern of fish migrating near the north bank. Quantitative analyses of these data will allow bias issues to be examined, such as boat-avoidance effects and the assumption of uniform migration speed used in extrapolating fish behaviour from the south bank to the north bank.

5. A two-day DIDSON trial was conducted at an upstream site near Boston Bar. Information for examining the feasibility of using this technique to enumerate fish passage at the site was gathered.

6. Staff completed analyses of the DIDSON observations and published the results in PSC Technical Report No. 16[5].

In summary, the split-beam system was successfully implemented at the Mission hydroacoustic station as an in-season estimator during the 2005 management season, even though the system faced unprecedented high daily salmon passage (up to 700,000 fish) for a number of days between late August and mid September. The system was likely saturated during these high passage periods.

Stock Identification

PSC staff conduct programs designed to identify the stock proportions of Fraser River sockeye and pink salmon in commercial, test and First Nations catches. These data provide

[5] Xie, Y., A. P. Gray, F. J. Martens, J. L. Boffey and J. D. Cave. 2005. Use of Dual-Frequency Identification Sonar to Verify Salmon Flux and to Examine Fish Behaviour in the Fraser River. Pacific Salmon Comm. Tech. Rep. No. 16: 58 p.

information on the abundance and timing of sockeye and pink salmon as they migrate to their natal rivers in the Fraser River watershed. Stock identification data are also used to account for Fraser River sockeye and pink salmon wherever they may be caught, and to apportion the daily estimates of sockeye escapement past Mission into discrete stock groups. Stock identification methods for sockeye salmon in 2005 used DNA[6] and scale pattern analyses[7] from fish caught in marine and in-river fisheries. Stock identification for pink salmon in 2005 relied on protein electrophoretic analyses of commercially caught fish.

A. Sockeye Salmon

Analyses of samples from catches in commercial and test fisheries were conducted daily, beginning in late June and continuing through late September. Commission staff sampled test fishing catches and commercial sockeye landings at several sites in British Columbia and Washington (Vancouver, Nanaimo, Port Hardy, Quadra Island and Campbell River in British Columbia, and Bellingham and Blaine in Washington). The Alaska Department of Fish and Game (ADF&G) collected samples for the PSC from the District 104 purse seine fishery, while DFO provided samples from Johnstone Strait test fisheries. In addition, at the PSC's request, DFO and First Nations personnel coordinated weekly scale sampling of Fraser River First Nations fisheries.

Both scale and DNA-based analyses included model adjustments based on assumptions about the migratory timing of sockeye stocks. Application of models to scale data used prior adjustments, i.e., inclusion of stock groups in models was based on their likelihood of presence. For example, samples collected from Area 20 in July were not examined with models that included Birkenhead sockeye scale standards. Adjustments of DNA-based allocations were made after analyses by examining unadjusted results and considering predicted misallocation rates among stock groups (e.g., allocations to Early Stuart sockeye populations in samples collected from marine areas after early August were interpreted as misclassification of Late Stuart sockeye).

Stock discrimination is most challenging during the transition from mostly Early Summer stocks to high proportions of Summer-run stocks, and the transition from mostly Summer-run to mostly Late-run stocks. The difficulty was exacerbated in 2005 by the much later than normal and protracted returns of most sockeye stocks. This increased the overlap in migration between Late-run sockeye and earlier management groups (see Figure 3 in main body of report). The increased migration overlap was more problematic for scale analyses than for DNA analyses. Scale analyses contributed greatly to assessments of highly abundant Harrison sockeye, however, because of their distinct age structure is identifiable via scales.

Proportions of Fraser River sockeye in Alaska District 104 fisheries were estimated using discriminant function analysis of scale data for age 4_2 sockeye. These estimated proportions were then expanded to account for other ages, on the basis of estimated age compositions of Fraser sockeye in Area 12 and 20 test fisheries. In 2005, DNA samples were also collected during the time period of highest sockeye catches in District 104. Scale and DNA based results were congruent. District 104 purse seine catches in 2005 included 522,000 sockeye, of which approximately 65% were age 4_2. Nearly 76% of these fish were estimated to be Fraser River age 4_2 sockeye, and Fraser sockeye contributed less to catches of other age groups. Approximately 294,000 sockeye caught in District 104 were estimated to be of Fraser River origin.

Baselines for DNA analysis in 2005 were similar to those used in 2004, except that DNA analyses of samples from District 104 necessarily used a geographically more extensive baseline. A new software package was used (cBayes, supplied by DFO's Molecular Genetics Lab in Nanaimo) to reduce small-stock overestimation bias. Results from the new software were obtained in parallel with results from the original software (SPAM, from ADF&G) and appeared to reduce the overestimation of small stocks in some cases. Evaluation of this software is ongoing.

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[6] Beacham, T.D., M. Lapointe, J.R. Candy, B. McIntosh, C. MacConnachie, A. Tabata, K. Kaukinen, L. Deng, K.M. Miller and R.E. Withler. 2004. Stock identification of Fraser River sockeye salmon using microsatellites and major histocompatibility complex variation. Trans. Am. Fish. Soc. 133: 1117-1137.

[7] Gable, J. and S. Cox-Rogers. Stock identification of Fraser River sockeye salmon: methodology and management application. PSC Tech. Rep. No. 5, October, 1993.

B. Pink Salmon

Catches of Fraser River pink salmon harvested in mixed stock fisheries have been estimated using GSI (genetic stock identification) techniques since 1987 [8]. The GSI program relies on genetic differences among stocks of pink salmon, expressed as different enzyme phenotypes in their body tissues. Pink salmon that spawn in Washington and British Columbia have been sampled and their tissues (muscle, heart, liver and eye) electrophoretically analyzed. These genetic data have been compiled into baselines that profile the genetic characteristics of each pink salmon stock. During the in-season management period, muscle tissue samples from 90 pink salmon were collected weekly from fisheries of interest. After electrophoretic screening of the tissue samples, the results were analyzed using a maximum likelihood (MLE) model. The model compares known genetic standards (from baseline samples) to genetic data from samples of unknown stock composition (from in-season, mixed-stock fishery samples) and generates estimates of the most likely stock composition.

In 2005, as has occurred since 1999, there were few large-scale commercial fisheries directed at Fraser River pink salmon. Consequently, only a small number of samples were required for GSI. The primary uses of the GSI estimates of stock contributions in 2005 were catch allocation, migration analyses and run-size estimation. GSI samples were collected in Canadian statistical Areas 12, 13 and 20, and U.S. Areas 7 and 7A from early August to mid September. The pattern of Fraser pink contributions relative to other co-migrating stocks from Puget Sound and Canada was generally consistent with GSI analyses in previous years.

[8] White, B.A. 1996. Genetic Stock Identification of Fraser River Pink Salmon: Methodology and Management Application. Pacific Salmon Comm. Tech. Rep. No. 7: 44p.

APPENDIX J: DIFFERENCES BETWEEN ESTIMATES IN 2005

Note: Since this analysis was completed there have been minor revisions to the estimates. The revised estimates are used throughout the report.

Summary

In 2005 there was a substantial difference (4,690,000 fish) between the estimates of potential spawning escapement (Mission escapement minus catch upstream of Mission, excluding Pitt sockeye) and arrivals on the spawning grounds.

Mission Escapement	Catch Upstream	Potential Escapement	Spawning Escapement[1]	**Difference between ests.**
8,408,000	559,000	7,849,000	3,246,000	**4,603,000**

[1] Excludes Pitt river sockeye as they do not migrate past Mission

Our post-season analyses suggest that approximately 60% of this difference can be attributed to biases in species composition assessments obtained from in-river gillnet test fisheries that were applied to Mission acoustic estimates to estimate total sockeye passage. The problem in estimating species composition was unprecedented in 2005 due to the extremely late arrival of sockeye and early upstream migration of pink salmon. Estimates of species composition derived from marine purse seine catches were used to generate post-season estimates of Mission escapement. The revised Mission estimate, 5,624,000 sockeye, is 2,784,000 fish less than the in-season estimate. A further 24% of the difference can be attributed to en route losses between Mission and the spawning grounds as estimated by a radio tagging program in 2005. An additional 8% of the difference is consistent with predictions from a model that relates historical differences between estimates to river conditions (temperature and flow). The remaining 7% of the difference is unexplained. Details of these components are reviewed below in the sections indicated in Table 1.

Table 1. Disposition of differences between estimates

In-season difference between estimates		4,603,000	(from above)
Accounted for by species composition bias		2,784,000	(60%; section I below)
En-route loss estimated from tagging (Summer-run)		1,100,000	(24%; section II)
Predicted by MA models (Early Stuart, Early Summer)		356,000	(8%; section III)
	Total explained	4,240,000	92%
	Remainder unexplained	363,000	8%

Fisheries management outcomes (section IV) were not negatively impacted by the in-season biases in species composition and en route losses. Spawning escapements in 2005 were similar to historical averages on this cycle and post-season estimates of Late-run exploitation rates were well below limits established in management objectives.

I. Biases in Species Composition

1. The split-beam technology used by the Mission acoustic program is unable to distinguish among species of salmon. The acoustic system can therefore only provide estimates of the total salmon of all species migrating upstream past the Mission site.

2. Data collected during the 2005 season do not indicate any significant problems with Mission acoustic estimates of total salmon passage. The Mission program may have underestimated total salmon passage due to the near-shore migration of pink salmon. This potential bias is in the opposite direction needed to explain the difference.

3. Prior to and during the 2005 season, PSC staff expressed concern to the Fraser River Panel that the presence of large numbers of pink salmon could cause biases in estimates of species composition (the proportion of each salmon species passing Mission). Species composition is estimated by a gillnet test fishery operated at Whonnock, B.C., which tends to overestimate sockeye proportions when pink salmon are present because pink salmon often migrate close to

shore where they are less vulnerable than sockeye salmon to fishing gear. Such overestimates of sockeye proportions result in overestimates of total numbers of sockeye passing Mission. Consequently, hydroacoustic estimates of sockeye passage are typically replaced with estimates based on river test fishery catch per unit effort (CPUE) and historical expansion lines in odd years (e.g., 2001, 2003, 2005) when pink salmon become abundant in the river. In most past years this substitution of test fishing indices of sockeye passage was applied after mid-September, and therefore affected estimates of only Late-run escapement. However, the impact of species composition bias was exacerbated in 2005 by early upstream migration of pink salmon combined with the extremely late arrival of sockeye salmon. This resulted in in-river migrations of sockeye and pink salmon that were nearly completely overlapped (see Figure 4 in body of report).

4. A post-season analysis was conducted to investigate several alternative methods of estimating species composition.

Summary of results from alternative methods used to compute species composition at Mission in 2005

Method	Sockeye Salmon	Pink Salmon	Other Salmon	Total Salmon
1 Final In-season Data	8,408,000	4,432,000	415,000	13,255,000
2 Whonnock G-G Method	8,041,000	3,543,000	1,671,000	13,255,000
3 Whonnock All-Catches Method	7,892,000	3,444,000	1,918,000	13,254,000
4 Historical River T.F. C/E Expanded	2,303,000	10,310,000	672,000	13,285,000
5 Marine P.S.T.F. Expanded	5,482,000	7,206,000	415,000	13,103,000
6 Marine P.S.T.F. Unexpanded	6,403,000	6,436,000	415,000	13,254,000

Notes

a Other salmon for methods 1, 5, 6 were estimates from a combination of in-season data and expert judgement

b Total salmon numbers vary due to small differences in time periods for which data was available for each method

c Sockeye numbers through September 20, final post-season estimate for the entire season was 5,624,000 fish

Description of method

1 Combination of ratios of catches by species from Cottonwood and Whonnock test fisheries

2 Ratios of catches by species at Whonnock including only those fish gilled or girthed by the net (traditional method)

3 Ratios of catches by species at Whonnock including all fish caught

4 Combination of catch per unit effort at Cottonwood and Whonnock test fisheries times historical expansion lines

5 Ratio of abundances derived from marine purse seine test fishery catch per effort times historical expansion lines

6 Ratio of catches from marine purse seine test fisheries

The first three methods that used catch ratios from river test fisheries all overestimated sockeye proportions, because the near-shore migration of pink salmon make them less vulnerable than sockeye to gillnets. Thus these three methods generated the largest estimates of sockeye passage. The fourth method involving substitution of river test fishery CPUE data was rejected for two reasons. First, CPUEs in 2005 were severely reduced due to the removal of fish from the nets by seals. When expansion lines from past years were applied they resulted in the lowest estimate of sockeye passage. Second, there were too few days of comparable sockeye migration prior to days of significant pink salmon abundance to generate a reliable estimates of expansion factors using 2005 data. The fifth method generated species composition estimates from marine purse seine test fishery CPUE data for each species, expanded these to total abundances and then adjusted for appropriate travel times between the purse seine test fishery sites and Mission. The last method was similar to the previous method except that marine purse seine catches were not expanded to total abundance and thus it was less valid. Method 5 was considered to be the best method. When species composition estimates from this method were applied to Mission hydroacoustic estimates of total salmon, they generated a post-season estimate of 5,624,000 sockeye passing Mission. This revised estimate was 2,784,000 fish less that the in-season estimate and it reduced the in-season difference between estimates by 60%.

Post-season revision

In-season Mission estimate	Post-season estimate	**Difference**
8,408,000	5,624,000	**2,784,000**

A comparison of in-season and post-season estimates of daily proportions and abundances of sockeye are shown in Figure 1.

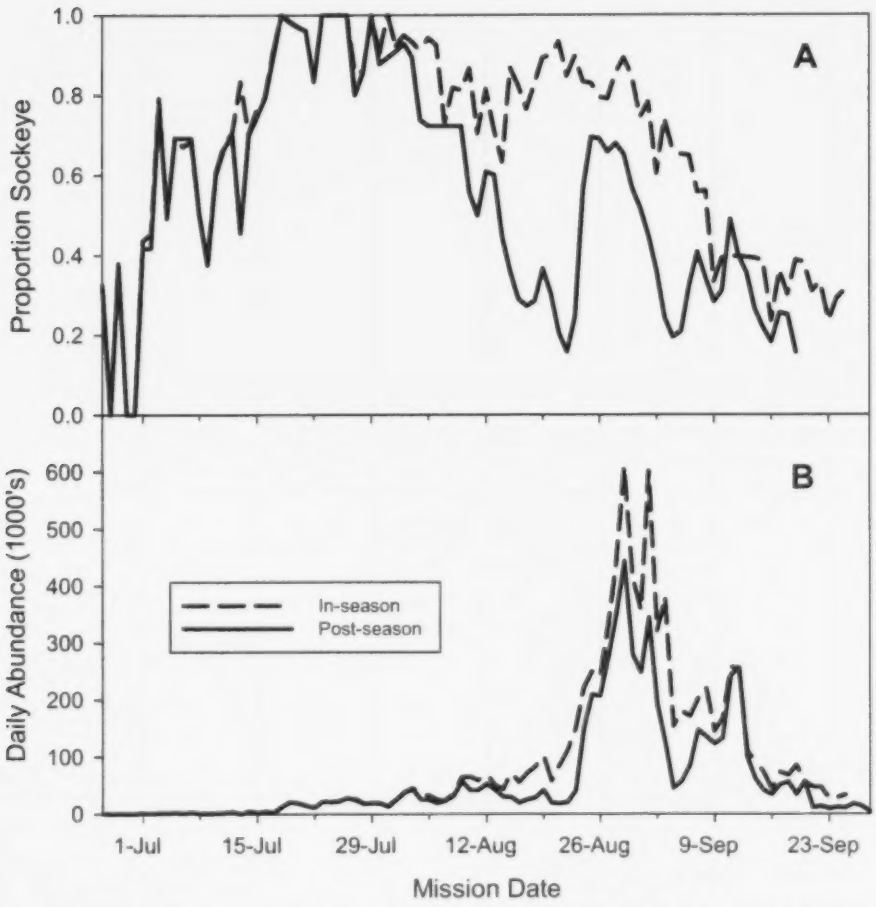

Figure 1. In-season and post-season estimates of: A) the proportion of sockeye and B) the daily abundance of sockeye at Mission. Species composition from in-river gillnet test fisheries were used both in-season and post-season through August 9, resulting in nearly identical daily abundance estimates. After August 9, post-season estimates of species composition were generated from marine purse seine test fishery CPUE data (see text for details). Post-season daily abundances after September 20 were generated from Whonnock gillnet test fishery CPUEs times the prior five-day expansion line.

II. Estimates of En route Losses From the 2005 Radio Tagging Program

5. A radio tagging program was conducted by LGL Ltd. in the Fraser River in 2005. Approximately 400 fish were tagged below Mission over a six week period and tracked to their spawning areas. These data can be used to independently quantify the fraction of fish that passed Mission and failed to reach the spawning grounds. Because the tagging study focused on the period of Summer-run migration, mortality rates can only be accurately assessed for that run-timing group. Approximately 43% of the tagged Summer-run sockeye that passed Mission failed to reach the spawning grounds (see table below).

Tagged Fish Passing Mission	Tagged Fish reaching spawning grounds	Tagged Fish not reaching spawning grounds	%Loss
271	154	117	43%

The mortality rate is lower when estimated from weekly migration components (36.3%), because mortality rates varied over time and most fish migrated during periods when the mortality rates were less than 43%.

6. When applied to the post-season Mission estimates, the tagging estimates of mortality rate can be used to estimate total mortality (from both fishing and natural sources) between Mission and the spawning grounds. The total loss estimated upstream of Mission less catch provides an estimate of en route loss. The en route loss estimate includes both natural (predation, stresses due to extremely late arrival, etc.) and fishing induced (discards, net drop-out, etc.) sources of mortality. Calculations for Summer-run sockeye are provided below.

Mission Escapement	%Mortality from tagging	Total mortality [1]	Catch upstream of Mission	**En route loss upstream of Mission**
4,373,000	36.30%	1,587,000	487,000	**1,100,000**

1 Updated from Table 10 in Robichaud and English 2006.

River conditions were generally favorable during the Summer-run migration period in 2005. However, the migration timing was the latest observed in 30 years of records and fish size was much smaller than average. Anecdotal evidence from observers handling fish caught in fish wheels in the lower Fraser Canyon suggested that some of the late-timed fish were very mature and ready to spawn far downstream of their natal areas. Sockeye were also observed spawning in a few non-traditional areas downstream of their spawning grounds, suggesting these fish had insufficient energy to complete their migration. A significant fraction of the radio-tagged fish were last detected in the area around Lillooet, upstream of difficult passage areas in the Fraser Canyon, but still short of their natal spawning areas.

Unfortunately, insufficient tags were applied to the other run-timing groups to permit estimation of total mortality.

III. Expected differences based on Environmental Management Adjustment Models

The Fraser River Panel uses management adjustment (MA) models to make in-season adjustments to escapement targets, to compensate for natural and stock assessment factors that can result in fewer fish reaching the spawning ground than projected by the Mission program. In-season, the MA models predict differences between estimates based on combinations of forecasted and observed Fraser River temperature and flow conditions. In the post-season, this model can also be used to predict the expected difference between estimates based on post-season estimates of the number of fish that passed Mission and observed temperature and flow conditions. The post-season predictions of differences for Early Stuart and Early Summer-run sockeye are 89,000 and 268,000 fish, respectively. A difference of 357,000 fish was expected for Early Stuart and Early Summer-run sockeye given the environmental factors that they encountered during their 2005 upstream migration. The observed differences for these two run-timing groups based on the post-season Mission estimates are 354,000 fish (99,000 for Early Stuart and 254,000 for Early Summer-run stocks).

IV. Outcomes from Management

7. The number of sockeye that arrived at their spawning grounds in 2005 did not create a conservation concern. The following table shows that spawning escapements in 2005 were well above historical averages for Early Summer, Summer and Late-run stocks. The escapement of Birkenhead sockeye was near the average, while Early Stuart escapements were below average.

Timing Group	Near-final Estimate of Adult Spawning Escapement	Historical Average on 2005 Cycle (Adults only)
Early Stuart	99,000	232,000
Early Summer (including Pitt)	225,000	90,000
Summer	2,455,000	1,807,000
Birkenhead	59,000	50,000
Late	471,000	59,000
Total	3,309,000	2,238,000

8. Correction for the bias resulted in decreases in total run sizes and increases in estimates of exploitation rates. However, exploitation rates were very low for all run-timing groups. Late-run exploitation rates were less than the limits of 15% for Late-run stocks and 10-12% for Cultus sockeye specified in management objectives.

Timing Group	Post-season Run Size	Catch (all areas)	Exploitation Rate
Early Stuart	218,000	20,000	9%
Early Summer (including Pitt)	624,000	150,000	24%
Summer	5,398,000	1,499,000	28%
Birkenhead	163,000	20,000	12%
Late	628,000	73,000	12%
Total	7,031,000	1,762,000	25%

APPENDIX K: HISTORICAL CATCH, ESCAPEMENT AND PRODUCTION DATA

Table 1. Commercial net catches of Fraser River sockeye salmon in Canadian Area 20 (Juan de Fuca Strait) by week for cycle years 1993-2005.

Date [1]	1993	1997	2001	2005
Jul. 3-Jul. 9	0	0	0	0
Jul. 10-Jul. 16	0	0	0	0
Jul. 17-Jul. 23	0	0	0	0
Jul. 24-Jul. 30	0	0	0	0
Jul. 31-Aug. 6	10,000	0	0	0
Aug. 7-Aug. 13	136,000	0	48,000	0
Aug. 14-Aug. 20	314,000	37,000	0	0
Aug. 21-Aug. 27	0	105,000	0	0
Aug. 28-Sep. 3	0	117,000	0	0
Sep. 4-Sep. 10	0	0	0	0
Sep. 11-Sep. 17	0	0	0	0
Sep. 18-Sep. 24	0	0	0	0
Sep. 25-Oct. 1	0	0	0	0
Oct. 2-Oct. 8	0	0	0	0
Oct. 9-Oct. 15	0	0	0	0
Total	460,000	259,000	48,000	0

1 Dates for the current year. For other years, data from the nearest week were used.

Table 2. Commercial net and troll catches of Fraser River sockeye salmon in Canadian Areas 17, 18, and 29 (Strait of Georgia and lower Fraser River) by week for cycle years 1993-2005.

Date [1]	1993	1997	2001	2005 [2]
Jul. 3-Jul. 9	0	0	0	0
Jul. 10-Jul. 16	0	98,000	0	0
Jul. 17-Jul. 23	0	0	0	0
Jul. 24-Jul. 30	141,000	60,000	0	0
Jul. 31-Aug. 6	50,000	0	51,000	0
Aug. 7-Aug. 13	60,000	18,000	6,000	0
Aug. 14-Aug. 20	164,000	119,000	0	0
Aug. 21-Aug. 27	260,000	282,000	12,000	0
Aug. 28-Sep. 3	0	451,000	0	0
Sep. 4-Sep. 10	1,970,000	302,000	0	3,000
Sep. 11-Sep. 17	74,000	4,000	0	0
Sep. 18-Sep. 24	30,000	0	0	0
Sep. 25-Oct. 1	10,000	0	0	0
Oct. 2-Oct. 8	8,000	0	0	0
Oct. 9-Oct. 15	0	0	0	0
Total	2,767,000	1,334,000	69,000	3,000

1 Dates for the current year. For other years, data from the nearest week were used.

2 Catch from an Area E protest fishery in Area 29.

Table 3. Commercial troll landings of Fraser River sockeye salmon in Canadian Areas 121 to 127 (west coast of Vancouver Island) by week for cycle years 1993-2005.

Date [1]	1993	1997	2001	2005
Jul. 3-Jul. 9	0	0	0	0
Jul. 10-Jul. 16	0	0	0	0
Jul. 17-Jul. 23	0	0	0	0
Jul. 24-Jul. 30	0	0	3,000	0
Jul. 31-Aug. 6	0	0	5,000	0
Aug. 7-Aug. 13	3,000	0	8,000	0
Aug. 14-Aug. 20	352,000	0	0	0
Aug. 21-Aug. 27	253,000	0	0	0
Aug. 28-Sep. 3	0	0	0	0
Sep. 4-Sep. 10	7,000	0	0	0
Sep. 11-Sep. 17	5,000	0	0	0
Sep. 18-Sep. 24	4,000	0	0	0
Sep. 25-Oct. 1	0	0	0	0
Oct. 2-Oct. 8	1,000	0	0	0
Oct. 9-Oct. 15	0	0	0	0
Total	625,000	0	16,000	0

1 Dates for the current year. For other years, data from the nearest week were used.

Table 4. Commercial net and troll catches of Fraser River sockeye salmon in Canadian Areas 11 to 16 (Johnstone Strait and northern Strait of Georgia) by week for cycle years 1993-2005.

Date [1]	1993	1997	2001	2005 [2]
Jul. 3-Jul. 9	0	0	0	0
Jul. 10-Jul. 16	0	46,000	0	0
Jul. 17-Jul. 23	0	0	0	0
Jul. 24-Jul. 30	20,000	7,000	47,000	0
Jul. 31-Aug. 6	29,000	502,000	87,000	1,000
Aug. 7-Aug. 13	477,000	827,000	30,000	0
Aug. 14-Aug. 20	3,503,000	2,069,000	0	0
Aug. 21-Aug. 27	2,904,000	1,255,000	1,000	0
Aug. 28-Sep. 3	252,000	726,000	0	0
Sep. 4-Sep. 10	1,285,000	573,000	0	0
Sep. 11-Sep. 17	184,000	147,000	0	125,000
Sep. 18-Sep. 24	21,000	173,000	0	0
Sep. 25-Oct. 1	8,000	83,000	0	0
Oct. 2-Oct. 8	1,000	0	0	0
Oct. 9-Oct. 15	0	0	0	0
Total	8,684,000	6,408,000	165,000	126,000

1 Dates for the current year. For other years, data from the nearest week were used.

2 Includes selective fishery catches.

Table 5. Catches of Fraser River sockeye salmon in Canadian First Nations fisheries by area for cycle years 1993-2005.*

Fishing Area		1993	1997	2001	2005
Fraser River Mainstem					
Below Port Mann	*1*	139,300	197,100	107,900	96,000
Port Mann to Mission	*1*	57,200	193,400	73,600	64,000
Mission to Hope		189,600	104,000	90,500	135,000
Hope to Sawmill Cr.		254,900	299,700	132,000	169,000
Sawmill Cr. to Kelly Cr.		134,200	191,000	185,400	163,000
Kelly Creek to Naver Cr.	*2*	42,400	53,200	32,200	15,000
Above Naver Cr.	*2*	2,600	6,900	7,700	7,000
Total		820,200	1,045,300	629,300	649,000
Tributaries					
Harrison/Lillooet System		n/a	n/a	n/a	n/a
Thompson System		100	200	1,100	9,000
Chilcotin System		16,500	15,600	18,700	26,000
Nechako System		3,400	1,900	5,500	1,000
Stuart System		7,800	12,200	9,100	5,000
Total		27,800	29,900	34,400	41,000
Total Fraser Catch		848,000	1,075,200	663,700	690,000
Marine Areas		185,000	121,000	184,000	267,000

* Data supplied by DFO.

1 Prior to 1995, the divisions were Steveston, and Deas to Mission.

2 Prior to 1994, the divisions were Churn Creek to Hixon, and above Hixon.

Table 6. Commercial net catches of Fraser River sockeye salmon in United States Areas 4B, 5, 6, 6C, 7, and 7A (Juan de Fuca Strait and northern Puget Sound) by week for cycle years 1993-2005.

Date [1]	1993	1997	2001	2005
Jul. 3-Jul. 9	0	11,000	0	0
Jul. 10-Jul. 16	0	86,000	0	0
Jul. 17-Jul. 23	0	11,000	0	0
Jul. 24-Jul. 30	0	18,000	9,000	1,000
Jul. 31-Aug. 6	4,000	36,000	213,000	1,000
Aug. 7-Aug. 13	235,000	91,000	0	2,000
Aug. 14-Aug. 20	672,000	190,000	9,000	117,000
Aug. 21-Aug. 27	909,000	238,000	0	51,000
Aug. 28-Sep. 3	343,000	138,000	0	31,000
Sep. 4-Sep. 10	495,000	274,000	0	5,000
Sep. 11-Sep. 17	34,000	225,000	0	0
Sep. 18-Sep. 24	0	19,000	0	0
Sep. 25-Oct. 1	0	1,000	0	0
Oct. 2-Oct. 8	0	0	0	0
Oct. 9-Oct. 15	0	0	0	0
Total	2,692,000	1,338,000	231,000	208,000

1 Dates for the current year. For other years, data from the nearest week were used.

Table 7. Commercial net catches of Fraser River pink salmon in Canadian Area 20 (Juan de Fuca Strait) by week for cycle years 1999-2005.

Date [1]	1999	2001	2003	2005
Jul. 3-Jul. 9	0	0	0	0
Jul. 10-Jul. 16	0	0	0	0
Jul. 17-Jul. 23	0	0	0	0
Jul. 24-Jul. 30	0	0	0	0
Jul. 31-Aug. 6	0	8,000	0	0
Aug. 7-Aug. 13	0	0	4,000	0
Aug. 14-Aug. 20	0	0	0	0
Aug. 21-Aug. 27	0	0	0	0
Aug. 28-Sep. 3	0	0	0	0
Sep. 4-Sep. 10	0	0	0	0
Sep. 11-Sep. 17	0	0	0	0
Sep. 18-Sep. 24	0	0	0	0
Sep. 25-Oct. 1	0	0	0	0
Oct. 2-Oct. 8	0	0	0	0
Oct. 9-Oct. 15	0	0	0	0
Total	0	8,000	4,000	0

1 Dates for the current year. For other years, data from the nearest week were used.

Table 8. Commercial net and troll catches of Fraser River pink salmon in Canadian Areas 17, 18, and 29 (Strait of Georgia and lower Fraser River) by week for cycle years 1999-2005.

Date [1]	1999	2001	2003	2005
Jul. 3-Jul. 9	0	0	0	0
Jul. 10-Jul. 16	0	0	0	0
Jul. 17-Jul. 23	0	0	0	0
Jul. 24-Jul. 30	0	0	0	0
Jul. 31-Aug. 6	0	0	3,000	0
Aug. 7-Aug. 13	0	0	15,000	0
Aug. 14-Aug. 20	0	0	0	0
Aug. 21-Aug. 27	0	0	0	0
Aug. 28-Sep. 3	0	0	0	0
Sep. 4-Sep. 10	0	0	1,000	1,000
Sep. 11-Sep. 17	0	0	0	0
Sep. 18-Sep. 24	0	0	0	0
Sep. 25-Oct. 1	0	0	0	0
Oct. 2-Oct. 8	0	0	0	0
Oct. 9-Oct. 15	0	0	0	0
Total	0	0	19,000	1,000

1 Dates for the current year. For other years, data from the nearest week were used.

Table 9. Commercial troll landings of Fraser River pink salmon in Canadian Areas 121 to 127 (west coast of Vancouver Island) by week for cycle years 1999-2005.

Date [1]	1999	2001	2003	2005
Jul. 3-Jul. 9	0	0	0	0
Jul. 10-Jul. 16	0	1,000	0	0
Jul. 17-Jul. 23	0	0	0	0
Jul. 24-Jul. 30	0	5,000	0	0
Jul. 31-Aug. 6	1,000	2,000	0	0
Aug. 7-Aug. 13	0	0	0	0
Aug. 14-Aug. 20	0	0	0	0
Aug. 21-Aug. 27	0	0	0	0
Aug. 28-Sep. 3	0	0	1,000	0
Sep. 4-Sep. 10	0	0	0	0
Sep. 11-Sep. 17	0	0	0	0
Sep. 18-Sep. 24	0	0	0	0
Sep. 25-Oct. 1	0	0	0	0
Oct. 2-Oct. 8	0	0	0	0
Oct. 9-Oct. 15	0	0	0	0
Total	1,000	8,000	1,000	0

1 Dates for the current year. For other years, data from the nearest week were used.

Table 10. Commercial net and troll catches of Fraser River pink salmon in Canadian Areas 11 to 16 (Johnstone Strait and northern Strait of Georgia) by week for cycle years 1999-2005.

Date [1]	1999	2001	2003	2005
Jul. 3-Jul. 9	0	0	0	0
Jul. 10-Jul. 16	0	0	0	0
Jul. 17-Jul. 23	0	7,000	0	0
Jul. 24-Jul. 30	0	10,000	0	0
Jul. 31-Aug. 6	2,000	31,000	20,000	0
Aug. 7-Aug. 13	0	0	311,000	0
Aug. 14-Aug. 20	0	0	28,000	0
Aug. 21-Aug. 27	0	150,000	0	0
Aug. 28-Sep. 3	4,000	530,000	0	0
Sep. 4-Sep. 10	0	0	2,000	0
Sep. 11-Sep. 17	0	0	436,000	124,000
Sep. 18-Sep. 24	0	0	0	0
Sep. 25-Oct. 1	0	0	0	0
Oct. 2-Oct. 8	0	3,000	3,000	0
Oct. 9-Oct. 15	0	0	0	0
Total	6,000	731,000	800,000	124,000

1 Dates for the current year. For other years, data from the nearest week were used.

Table 11. Catches of Fraser River pink salmon in Canadian First Nations fisheries by area for cycle years 1999-2005.*

Fishing Area	1999	2001	2003	2005
Fraser River Mainstem				
Below Port Mann	5,500	500	2,600	16,100
Port Mann to Mission	200	800	5,500	5,000
Mission to Hope	2,700	115,400	284,100	221,900
Hope to Sawmill Cr.	300	400	900	6,300
Sawmill Cr. to Kelly Cr.	0	0	0	14,500
Kelly Creek to Naver Cr.	0	0	0	0
Above Naver Cr.	0	0	0	0
Total	8,700	117,100	293,100	263,800
Tributaries				
Harrison/Lillooet System	0	0	0	0
Thompson System	0	0	0	400
Chilcotin System	0	0	0	0
Nechako System	0	0	0	0
Stuart System	0	0	0	0
Total	0	0	0	400
Total Fraser Catch	8,700	117,100	293,100	264,200
Marine Areas	56,700	16,000	0	182,500

* Data supplied by DFO.

Table 12. Commercial net catches of Fraser River pink salmon in United States Areas 4B, 5, 6, 6C, 7, and 7A (Juan de Fuca Strait and northern Puget Sound) by week for cycle years 1999-2005.

Date [1]	1999	2001	2003	2005
Jul. 3-Jul. 9	0	0	0	0
Jul. 10-Jul. 16	0	0	0	0
Jul. 17-Jul. 23	0	1,000	0	0
Jul. 24-Jul. 30	1,000	5,000	1,000	0
Jul. 31-Aug. 6	2,000	1,000	14,000	0
Aug. 7-Aug. 13	0	0	18,000	1,000
Aug. 14-Aug. 20	0	1,000	74,000	2,000
Aug. 21-Aug. 27	0	1,000	90,000	48,000
Aug. 28-Sep. 3	0	139,000	29,000	90,000
Sep. 4-Sep. 10	0	264,000	132,000	126,000
Sep. 11-Sep. 17	0	13,000	380,000	50,000
Sep. 18-Sep. 24	0	0	34,000	0
Sep. 25-Oct. 1	0	0	0	0
Oct. 2-Oct. 8	0	0	0	0
Oct. 9-Oct. 15	0	0	0	0
Total	3,000	425,000	772,000	317,000

1 Dates for the current year. For other years, data from the nearest week were used.

Table 13. Escapements of sockeye salmon to Fraser River spawning areas for cycle years 1989-2005.

DISTRICT	Estimated Number of Adult Sockeye *					Jacks
Stream/Lake	1989	1993	1997	2001	2005	2005
NORTHEAST						
Upper Bowron R.	2,534	1,184	4,811	5,842	1,649	0
STUART						
Early Runs						
Driftwood R.	250,301	430,226	29,639	15,684	9,877	0
Takla L. Streams	54,937	124,892	136,485	77,676	43,584	0
Middle R. Streams	47,876	71,551	64,465	39,212	22,961	0
Trembleur L. Streams	31,685	61,296	35,108	38,087	15,841	0
Early Stuart Total	384,799	687,965	265,697	170,659	92,263	0
Late Runs						
Kazchek Cr.	767	8,568	6,746	5,607	1,557	0
Kuzkwa Cr.	4,122	51,779	107,560	15,926	13,681	1
Middle R.	276,131	388,937	281,472	131,505	72,228	5
Tachie R.	287,290	1,339,755	491,098	187,591	185,879	10
Miscellaneous	7,387	15,930	20,776	10,886	19,779	4
Late Stuart Total	575,697	1,804,969	907,652	351,515	293,124	20
NECHAKO						
Nadina R. (Late)	545	1,000	4,588	19,891	9,049	0
Nadina Channel	4,395	8,595	4,911	34,849	12,785	0
Stellako R.	43,179	91,071	55,343	151,359	175,299	47
QUESNEL						
Upper Horsefly R.	658,452	1,649,829	929,821	1,816,654	617,737	23
Lower Horsefly R.	814,818	- 1	- 1	- 1	- 1	-
Horsefly Channel	23,300	17,891	0	-	-	-
McKinley Cr.	117,830	169,368	262,082	267,413	142,200	8
Mitchell R.	240,521	725,030	534,431	920,267	- 2	-
Miscellaneous	15,899	58,336	132,318	506,455	687,444 3	7
Quesnel Total	1,870,820	2,620,454	1,858,652	3,510,789	1,447,381	38
CHILCOTIN						
Chilko R.	51,580	549,845	978,328	668,783 4	535,967 4	4,514
Chilko Channel	1,459	5,381	7,499	-	-	-
Chilko L.-South End	10,229	- 5	- 5	- 5	- 5	-
Taseko L.	0	0	0	1,000	520	0
SETON-ANDERSON						
Gates Cr.	2,968	1,188	777	459	2,020	168
Gates Channel	13,995	16,764	5,721	12,462	13,130	1,094
Portage Cr.	7,900	19,760	9,766	3,150	12,082	8
NORTH THOMPSON						
Raft R.	1,647	5,047	6,093	32,498	26,456	45
Fennell Cr.	3,988	7,546	9,000	5,721	4,220	46
SOUTH THOMPSON						
Early Runs						
Seymour R.	5,507	10,114	2,254	6,892	3,516	851
Scotch Cr.	7,236	8,359	3,085	2,449	4,163	1,008
Upper Adams R.	0	0	0	605	221	53
Momich / Cayenne Cr.	0	0	0	290	109	26
Late Runs						
Lower Adams R.	73	540	979	3,142	12,371	22,509
Lower Shuswap R.	488	745	138	194	382	4,327
HARRISON-LILLOOET						
Birkenhead R.	29,334	244,954	50,202	44,450	53,546	898
Big Silver & misc. Birks.	272	1,291	1,674	12,348	5,315	221
Harrison R.	2,934	3,258	1,418	15,309	388,605	195
Weaver Cr.	4,864	34,555	4,275	4,205	12,948	162
Weaver Channel	12,303	49,901	21,229	15,710	35,568	159
LOWER FRASER						
Chilliwack R. & L.	89	500	773	30,272	3,407	0
Nahatlatch R. & L.	3,628	2,078	9,959	5,441	2,168	10
Cultus L.	418	1,063	88	515	112	114
Upper Pitt R.	16,037	22,835	35,798	131,481	62,047	15
MISCELLANEOUS	1,202	200,539	1,211	14,422	97,446	16,235
ADULTS	3,060,120	6,401,501	4,251,921	5,256,702	3,307,869	
JACKS	47,337	25,724	9,038	21,668	52,763	52,763
TOTAL NET ESCAPEMENT	3,107,457	6,427,225	4,260,959	5,278,370	3,360,632	

* Estimates are from DFO.

1 Included in Upper Horsefly River estimate.

2 No spawning ground estimate in 2005. Estimate is included in the 2005 Quesnel Lake system estimate.

3 Escapement to the Quesnel Lake system in 2005 was indirectly estimated. Spawning escapements throughout the Horsefly River system in the brood year (2001) were used to proportionally expand estimates from the enumerated stocks in 2005 to the entire watershed.

4 Includes Chilko Lake and channel.

5 Included in Chilko River estimate.

Table 14. Fraser River pink salmon production for odd brood years from 1961-2003.

Brood Year	Spawners		Potential Egg Deposition	Fry Production	Adult Returns (Catch + Escapement)	% Survival		Average Marine Survival To Date
	Total (millions)	Female (millions)	(millions)	(millions)	(millions)	Freshwater	Marine	
1961	1.094	0.654	1,569	143.6	5.482	9.2%	3.8%	3.8%
1963	1.953	1.216	2,435	284.2	2.320	11.7%	0.8%	2.3%
1965	1.191	0.692	1,488	274.0	12.963	18.4%	4.7%	3.1%
1967	1.831	0.973	2,132	237.6	3.931	11.1%	1.7%	2.8%
1969	1.529	0.957	2,018	195.6	9.763	9.7%	5.0%	3.2%
1971	1.804	1.096	1,923	245.4	6.801	12.8%	2.8%	3.1%
1973	1.754	1.009	1,865	292.4	4.894	15.7%	1.7%	2.9%
1975	1.367	0.781	1,493	279.2	8.209	18.7%	2.9%	2.9%
1977	2.388	1.362	2,960	473.3	14.404	16.0%	3.0%	2.9%
1979	3.561	2.076	3,787	341.5	18.685	9.0%	5.5%	3.2%
1981	4.488	2.560	4,814	590.2	15.346	12.3%	2.6%	3.1%
1983	4.632	2.931	4,702	554.8	19.104	11.8%	3.4%	3.2%
1985	6.461	3.561	5,900	256.1	7.172	4.3%	2.8%	3.1%
1987	3.224	1.856	3,471	406.9	16.484	11.7%	4.1%	3.2%
1989	7.189	4.383	7,198	360.0	22.180	5.0%	6.2%	3.4%
1991	12.949	8.002	12,330	697.0	16.983	5.7%	2.4%	3.3%
1993	10.768	6.454	9,192	439.0	12.904	4.8%	2.9%	3.3%
1995	7.175	4.248	10,233	272.3	8.176	2.7%	3.0%	3.3%
1997	2.842	1.740	2,863	252.9	3.586	8.8%	1.4%	3.2%
1999	3.422	1.885	2,702	222.8	21.174	8.2%	9.5%	3.5%
2001 [1]	19.725	9.543	16,274	680.9	26.000	4.2%	3.8%	3.5%
2003 [1]	n/a	n/a	n/a	419.0	10.000	n/a	2.4%	3.5%
Average	4.826	2.761	4,826	359.9	12.116	10.1%	3.5%	

[1] Estimates of adult returns from the 2001 and 2003 brood years have high uncertainty associated with them because DFO did not conduct escapement enumeration programs in the return years (2003 and 2005, respectively). Estimates of adult returns for these years are based on in-season run size estimates by the PSC.

APPENDIX L: STAFF OF THE PACIFIC SALMON COMMISSION IN 2005

EXECUTIVE OFFICE

Mr. D. Kowal, Executive Secretary

Ms. K. Bartlett, Secretary

Ms. S. Gibson, Information Technology Support Specialist

Ms. K. Mulholland, Information Technology Manager

Mrs. V. Ryall, Meeting Planner

Ms. T. Tarita, Records Administrator/Librarian

FINANCE AND ADMINISTRATION

Mr. K. Medlock, Controller

Ms. B. Dalziel, Accountant

Mr. A. Mackay, Fund Manager

FISHERIES MANAGEMENT DIVISION STAFF

Mr. M. Lapointe, Chief Biologist

BIOMETRICS GROUP

Mr. I. Guthrie, Head

STOCK IDENTIFICATION GROUP

Mr. J. Gable, Head

Ms. H. Anozie, Scale Lab Assistant

Mr. V. Keong, Resource Management Technician (Term)

Mr. S. Latham, Stock Identification Biologist (Sockeye)

Ms. M. Reichardt, Senior Scale Analyst

Ms. J. Sellars, Assistant Scale Analyst

Mr. B. White, Stock Identification Biologist (Pink)

STOCK MONITORING GROUP

Mr. J. Cave, Head

Ms. J. Boffey, Hydroacoustics Technician (Term)

Mr. K. Forrest, Test Fishing Biologist

Mr. A. Gray, Hydroacoustics Biologist

Ms. F. Martens, Hydroacoustics Technician (Term)

Ms. C. Tovey, Test Fishing Biologist

Dr. Y. Xie, Hydroacoustics Scientist